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Navy refueling options in Southern California: an analysis of alternatives in case DFSP Point Loma is not available

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THESIS

NAVY REFUELING OPTIONS IN SOUTHERN CALIFORNIA: AN ANALYSIS OF ALTERNATIVES IN CASE DFSP POINT LOMA IS NOT AVAILABLE

by

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March 2001

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The Defense Fuel Supply Point (DFSP) at Point Loma California provides most of the fuel that the U.S. Navy assets use in the Southern California operating areas; 3,171,000 BBLS total of F-76 an JP-5 in Fiscal Year 2000. If it were disabled or destroyed, it would be vital that all personnel involved understand the numerous alternative methods of getting fuel to the fleet.

This thesis studies the offices and organizations that could be affected by the sudden removal of DFSP Point Loma as a fueling source, and examines the various alternative fueling options and methods. It looks at the options from the background of current fuel transportation methods and the reasons that might make a contingency fueling plan necessary. It discusses what considerations there would be to choosing an alternative, and gives four generic scenarios, walking through the options that might be best for each. The thesis ends with a summary of the findings, some conclusions, and some recommendations for DOD and for further studies.

The research was done through sources at the NPS Library, online, and on site including interviews and searching through files. From all of the information gathered, a number of conclusions can be drawn. The first one is that if DFSP Point Loma is destroyed or disabled that there are definitely other options for getting fuel to the fleet. The second and third conclusions are that the current fueling capabilities in Southern California support the Missions and Visions of MSC and DESC.

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DISCLAIMER

The views expressed in this thesis are those of the author and do not reflect the official policy of position of the Department of Defense or the U.S. government. Also it should be noted that although the author has gone to great lengths to assemble and analyze the list of options available, that the list should not be considered to be all inclusive, but rather used as a basis from which to look at these options and other options which may be available as appropriate.

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TABLE OF CONTENTS

LIST OF FIGURES

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I. INTRODUCTION

From October 1, 1999 through September 30 2000, the Defense Fuel Supply Point (DFSP) at Point Loma, CA delivered 1,902,000 BBLS F-76 and 1,268,000 BBLS JP-5 for 3,171,000 BBLS total, or 133,182,000 Gallons, (Note, BBLS = 1000 barrels, and 1 barrel = 42 gal.) of F-76 and JP-5 to U.S. Navy Ships and aircraft operating in waters off Southern California, mainly via Military Sealift Command (MSC) operated T-AOs (Auxiliary Oilers). From that standpoint, the DFSP at Point Loma is an important link in the flow chain from production to consumption for the F-76 and JP-5 that the Navy uses. If DFSP Point Loma were disabled for whatever reason, it is vital that all personnel involved understand the numerous viable options for delivering fuel to the Naval units afloat off Southern California in a timely fashion.

The system for delivering fuel to Navy units in Southern California is fairly straightforward unless a problem develops somewhere in the normal flow of fuel from production to end-users. Under the recent contracts, the primary fuels that the Navy uses for both its aircraft and ships, JP-5 and F-76, is refined in Washington State, San Francisco, and Long Beach, and then sent via numerous means to the fuel farm at San Diego where the T-AOs load to deliver it to the Navy ships at sea. One of the methods used to transport the fuel to San Diego is via contracted tanker ships. Originally this research focused on the possible cost savings of having T-AOs pull in to Long Beach to load cargo fuel where it was refined in order to save the transportation costs of bringing

the fuel to San Diego to then be onloaded to the T-AOs. From that point this work evolved to looking at where else the T-AOs could load cargo fuel to take to the Navy units afloat in Southern California if the Defense Fuel Supply Point at Point Loma was not available for any reason. This research therefore examines all of the options for getting fuel to the Southern California Naval units in case DFSP Point Loma is not available, briefly touching on the cost/savings analysis aspects of the different alternatives.

Currently there are various routes for delivering JP-5 and F-76 from the refineries in Washington State, San Francisco and Long Beach/Norwalk to Navy ships in Southern California. In all of these methods, the final leg of the fuel's journey involves loading JP-5 and F-76 from the tanks on Point Loma onto the Navy and MSC oilers to be taken out to the Southern California based Navy ships at sea, except in the rare cases in which a Navy ship is allowed to refuel in port. This is why it is important to explore alternate loading facility options for the Southern California ships, both oilers and combatants.

If a contingency loading option were used, the changes required to meet operational commitments with respect to the time and distance considerations need to be assessed. Other key areas relevant to the discussion include the quantities of fuel involved and the capabilities of the alternate loading options. The following report will analyze the advantages and disadvantages to the Navy and DOD of the different contingency loading options available. It will also demonstrate how having a contingency loading plan fits with MSC's Strategic Plan, and it will provide a reference

for implementing contingency loading operations for Southern California MSC and other Navy units.

In terms of alternate plans, for the purpose of this research we will look at four scenarios for contingencies. The first is a short-term scenario in which there has been a major disabling catastrophe at the DFSP Point Loma. While it is out of commission (OOC), there is a sudden need to refuel one or two battle groups as they get underway in support of a crisis situation or war scenario in the Western Pacific, Indian Ocean or Persian Gulf regions. The second is a long-term scenario in which the DFSP at Point Loma is again OOC, but the refueling needs are for regular Southern California operations and day-to-day training evolutions. The last two scenarios are variations on the first two, looking at the short term for normal operations and the long-term options to have ready in case of a sudden crisis situation. In all of the scenarios, there are ways that the afloat units can get the fuel they need, but the shorter fused options will take more work, bargain making, waivers, and of course money.

A. PURPOSE AND RESEARCH QUESTIONS

This thesis takes knowledge from all of the different offices involved in fuel transportation and combines this into an accurate depiction of the short and long term fueling options available for Southern California Naval units in case DFSP Point Loma is unusable. While much of the information has come directly from the DESC staff in Fort Belvoir, Virginia and San Pedro, California, the synthesis of their information along with

the ideas and information from MSC, MSCPAC, and the DFSP at Point Loma itself will provide useful information for everyone involved, even for those who provided large portions of this information. This study will provide a much better understanding of what options are available in case DFSP Point Loma is disabled, and of what offices are involved and what coordination will be needed to quickly and effectively implement the appropriate option. This study may provide a better ability to cope with a potential problem in the flow chain of the fuel from production to the end users.

In terms of the questions that are answered, the primary question is, "What methods are available to get JP-5 and F-76 to the fleet in the event of a major problem at DFSP Point Loma?" There were a number of secondary questions that were important in the research process, but the most significant ones were the following:

- What is the current route that JP-5 and F-76 take from production to the ships afloat in Southern California and who has custody/responsibility for the fuel along the way?
- What agencies and offices are involved with getting fuel from production to the end users in the Navy in Southern California, and what are their relationships?
- What are the fuel storage capacities in San Diego and alternate port facilities?
- What should be considered in choosing an alternate loading plan?
- What impacts, advantages and disadvantages would there be to each option?
- What would have to be done to implement those alternatives?

- How does each contingency load plan fit with MSC's Strategic Plan and the guidance of DESC and other government agencies and offices?

- How would using a contingency loading plan affect the operations and readiness of the oilers, MSC contracted T-5 tankers, Afloat Training Group (ATG), and other Navy units?

By answering these questions the Southern California fueling system becomes much clearer. The options discussed each have their own advantages and drawbacks, but with a better understanding of the options available, the key decision makers can make more informed decisions in the event of a disruption at DFSP Point Loma.

B. SCOPE AND METHODOLOGY

The scope of this thesis includes: (1) a review of current JP-5 and F-76 distribution procedures for Southern California, (2) an in-depth review of the issues involved with loading JP-5 and F-76 without using DFSP Point Loma, (3) a discussion of the different options, and their individual impacts, (4) an evaluation of the costs and benefits of loading JP-5 and F-76 via alternate means, and (5) a feasibility study of implementing the loading options. The thesis will conclude with a recommendation for the most desirable options for getting fuel to the Navy assets afloat off Southern California, and a short review of the issues involved.

The methodology used in this thesis research consisted of the following steps:

- Conducted a literature search of books, magazine articles, theses, nautical charts, and other library information resources.

- Conducted a thorough review of information available online.

- Conducted a review of the current JP-5 and F-76 transportation system in Southern California.
- Determined specifically which offices are involved in the JP-5 and F-76 transportation issues.
- Interviewed key people from the important offices over the phone.
- Discussed what archives and files were available at the various facilities.
- Arranged for personal interviews at selected offices and conducted interviews, archive and data searches.
- Identified advantages and disadvantages of the various options.
- Conducted a cost-benefit and feasibility analysis for each option.
- Prepared a recommendation for the best options in case DFSP Point Loma is not available.

C. ORGANIZATION OF STUDY

This thesis is divided into five chapters. The first chapter is the introduction, which describes the purpose of the study, the questions asked and answered, the scope and methodology, and the organization of the study. The end of the first chapter describes the expected benefits from the thesis.

The second chapter goes deeper into the background information and frames the current Southern California fueling situation in more detail. Chapter two begins by describing the different offices and organizations that are involved in getting fuel to the Naval ships and aircraft in Southern California. Chapter two then reviews the various fuel transportation methods and routes that are currently employed. The third section of

chapter two describes the justification for contingency plans for the fuel that flows through the DFSP at Point Loma in San Diego. The closing of chapter two is divided into two sections; one briefly discusses the relevant literature and documentation; and one summarizes the whole chapter.

Chapter three analyzes each of the fueling options in depth. Each one is examined by first giving a detailed description of what would be required to implement that option, and the associated positive and negative aspects. Each option is also examined in terms of incidentals, such as port services, time distance considerations, security, and any other relevant issues. Finally, cost savings are analyzed for each option. While there may not be specific cost values for many of the options, this section still helps choose the best alternative for a given situation; chapter four discusses general situations.

As just stated, the information from chapter three will be the basis for the findings in chapter four. Chapter four goes from a brief introduction into implementation and choosing an alternative. It looks at the most significant inputs for planning and selecting an alternative and then selects the best option for four generic situations. The four situations look at short and long term fueling scenarios for both crisis and normal operational evolutions, and describe the best option for each.

Chapter five, the closing chapter, ties together the first four chapters by discussing the conclusions and recommendations. It looks at how the contingency plans fit with MSC's Strategic Plan, and then provides a summary and recommendations. Chapter five

also describes related subjects that are suggested for further research and study before giving a closing conclusion.

D. EXPECTED BENEFITS OF THIS THESIS

This study provides the information required to choose an alternate method of delivering JP-5 and F-76 to the Southern California Naval units afloat in the case of a major disabling catastrophe at DFSP Point Loma. It gives the most desirable options for a short-term scenario in which a large number of ships are suddenly tasked with getting underway from San Diego for operations in the Western Pacific, Indian Ocean or Persian Gulf regions. It also gives the best options for a long term scenario in which the alternate fuel delivery methods are needed for routine operations and training evolutions in Southern California, and then combinations of both. It analyzes the different impacts and requirements of each of the options, and will serve as a reference for planning alternative loading options in the Southern California operational area.

II. BACKGROUND

This chapter discusses the current flow of fuel from refineries all the way to the end users. In order to do so effectively, the first section summarizes all of the offices involved in fueling issues for Southern California, and examines the impacts of and to each. The second section traces the physical flow of fuel from production to consumption, noting the responsible organizations along the way. Along with the flow issues, the chapter discusses the contracting and bidding process for the fuel. The last two subjects covered in the second section are the amount of JP-5 and F-76 taken to Southern California units on a yearly basis, and the transportation methods used along the way. The third section outlines the various reasons to have a contingency plan, and section four briefly discusses the information sources on the subject. A chapter summary is in section five.

A. RELEVANT OFFICES AND ORGANIZATIONS

In the process of conducting this research, it has become clear that there are a large number of government offices and organizations that are involved with Department of Defense fueling operations in Southern California. The ships and aircraft at sea, as the final users of the petroleum products, are affected by changes to the fuel transportation and logistics system. However, as long as they get their fuel fairly close to where and when they need it, they are not usually concerned with how the fuel traveled from its

production point to their fuel tanks. Likewise, the commanders of the amphibious squadrons, destroyer squadrons, and carrier groups all tend to be somewhat ambivalent as long as their ships receive gas when they need it. Even if fuel were not available, units would look to the Military Sealift Command Pacific (MSCPAC) and to a certain extent to the Afloat Training Group Pacific (ATGPAC) and Commander Naval Surface Group Pacific Northwest (COMNAVSURFGRUPACNOR-WEST) for answers about their fueling questions and concerns, if they could not get a waiver to refuel in port. Thus, looking backwards up the chain from the fuel end user, MSCPAC and the Afloat Training Group Pacific (ATGPAC) are the last two relevant offices before the end users in the normal flow of the fuel from production to user.

Before MSCPAC and ATGPAC comes the sources from which the Oilers get their load-outs of both JP-5 and F-76. The primary place for Navy units to on-load JP-5 and F-76 in Southern California is at the "fuel farm" at Point Loma in San Diego. The fuel farm gets its fuel via tankers and via pipeline, both of which are controlled by the Defense Energy Support Center (DESC), Los Angeles office. At that level, the Defense Logistics Agency (DLA), DESC (as part of DLA), DESC Los Angeles, and United States Commander in Chief Pacific Forces Joint Petroleum Office (USCINCPAC JPO) all have a significant impact on ensuring that the proper levels of petroleum products are maintained to support Department of Defense operations, and thus national policy in the event of a crisis. These offices ensure that sufficient quantities of petroleum products make it from the commercial refineries into the Department Defense fuel system.

Each of the above offices have significant roles in the chain of getting fuel from production to the end users afloat in the fleet. In this section, we will cover how each office is affected by the others, along with discussing the coordination between these and other related offices. To understand contingency plans and operations if the Point Loma Fuel Farm is not available, it is important to first have a good understanding of who is involved. Without getting too much into the information that will be covered in the next section, we will review the various offices in the order in which they come into play in the fuel flow chain from producer to end user.

1. Refineries

For our purposes, the first step in the flow chain for F-76 and JP-5 is the refineries. We will cover the refinery selection and contracting process in more detail in the next section, along with the Bid Evaluation Model, or BEM, but for now it is important to note where the refineries are and what delivery methods they use. These factors can have impacts that will be felt all the way through the system to the end user. The refineries are required to produce a certain amount of specific types of fuel under the contract, and to produce it within certain time frames. Different refineries can and often do win the contracts every year, which changes the fuel flow and custody chain every year.

2. Defense Logistics Agency

As the parent command of DESC, the Defense Logistics Agency (DLA) is important to the fueling discussion, although they have limited direct involvement in day-to-day fueling issues. DLA is responsible for supporting all branches of the military and even some civilian agencies with supply, technical and logistical support. Their assistance extends from the conceptual stages of planning new weapon systems all the way through the systems lifetime and to the "disposal of materiel that is obsolete, worn out, or no longer needed." (Ref. 1)

In their *Strategic Plan 2000, DLA 21,* DLA lists their vision as being "Right Item, Right Time, Right Place, Right Price, Every Time... Best Value Solutions For America's Warfighters." The five key portions of the DLA 21 strategic plan are Customer Knowledge/Focus, Business Systems Modernization, Strategic Sourcing of Materiel, Workforce Development, and Organizational Redesign. The goal of these five factors is "Transforming DLA Into a Smaller, More Agile, Logistics Combat Support Agency Able to Provide Better, Faster, Best Value Support to the Joint Vision 2010 Warfighter." From that viewpoint, it is clear why they view their five core competencies of Customer Knowledge, Logistics Information Management, Integrated Combat Logistic Solutions, Rapid Worldwide Response, and Single Face to Industry as being so vital to their operations. Defense Energy Support Center operates under these ideas and concepts, actively infusing the various aspects of DLA 21 into the procurement and delivery of fuel to the various U.S. installations, bases and ships around the world.

3. Defense Energy Support Center

The Defense Energy Support Center, or DESC, (formerly known as Defense Energy Office, or DEO, and formerly known as Defense Fuel Supply Center, or DFSC provides "the Department of Defense and our customers comprehensive energy support in the most effective and economical manner possible." Their vision is "To be recognized as the best and most effective energy support organization in the world." (Ref. 2) The key departments and divisions within DESC that are relevant to this research are Operations (which includes Facilities and Distribution Management, Bulk Fuels, and Direct Delivery Fuels), Contingency Plans & Operations Division, Resource Management, Procurement Policy, Small Business, and Market Research.

For the purposes of our discussion DESC "owns" the fuel from the point that it leaves the refineries discharge valve until the point at which the fuel passes the skin of the end user ship or aircraft. In fact, 61% of the fuel that DESC holds in its inventory is either F-76 or JP-5, the main two fuels discussed in this study. (Ref. 3) Headquartered in Fort Belvoir, Virginia, just outside Washington, DC, DESC controls the amount of fuel purchased, where, when, how, and from and for whom the fuel is purchased. DESC ensures that proper levels of fuel are available for the Department of Defense at all of the places where fuel will be needed worldwide. When DESC contracts for fuel, they include transportation from the refinery to the Defense Fuel Supply Point, or DFSP and, where relevant, the fuel's journey to the storage tanks at individual bases in the agreement and bids. Whether the fuel goes by pipeline, tanker, tank truck, or barge, the transportation

cost is included in the bid price. From the DFSPs, fuel can be transferred to bases, stations, and ships, who may then further issue it to other ships and aircraft.

Significant to operating DESC is their optimization process. In optimization, they conduct research and planning to develop solutions that more "efficiently operate and maintain Department of Defense (DOD) petroleum storage and distribution systems." The three types of fueling operations that they examine are: "GOGO," which means that the government owns and operates the facilities; "GOCO," which means that the government owns the facility but a contractor operates it; and "COCO," which means that the contractor owns and operates the facility. When requested, DESC evaluates the conversion of GOGO facilities to GOCO facilities, and the DESC Optimization team looks at the information available to determine if there is an economic benefit or significant contribution to national defense that is obtainable by proceeding with the conversion. DESC works with the Service and the base to assess the fuel facility. Their findings may include:

- Problems associated with current infrastructure and services
- Fuel infrastructure and services to be provided to include consolidation of facilities when feasible
- Recommendations which could include outsourcing, privatization, or status quo
- Estimated cost of Base's current operations
- Economics of the review/cost savings expected (Ref. 4)

From there, the service, base, and DESC can move forward to implement the optimal solution while still supporting their customers.

4. DESC LA

The Los Angeles office of DESC, (formerly known as the Defense Fuel Office and the Defense Energy Support Office) works closely with the DESC headquarters to satisfy the DOD fuel requirements in the Western United States. DESC LA technically works under DESC-Americas, which is headquartered in Houston, Texas, but this relationship is primarily administrative; most of the coordination occurs between DESC and DESC LA. Both offices work together to develop the details of the deliveries, with DESC LA responding to requests from bases and DFSPs in the Inland/West Coast area, including California, Oregon, Washington, Idaho, Montana, Utah, and Nevada. DESC LA also acts as a conduit for that information back to DESC Headquarters in Fort Belvoir. The two offices work especially closely together when assets are involved that are not specifically set aside for the Inland/West Coast region, such as the T-5 Tankers.

Another important aspect of the Los Angeles DESC is that they are also the San Pedro DFSP. Having DESC LA and a DFSP combined at one location facilitates coordination for San Pedro fueling evolutions, since much of the coordination can be completed by just going to the office next door or having a group meeting, rather than having to coordinate via conference call, e-mail, or even group meetings with people from multiple locations.

Another important aspect of the coordination between DESC and DESC LA is that since they both are interested in all aspects of the fuel distribution system in the Inland/West Coast region, there are some built-in backups. For example, a position in the DESC headquarters is dedicated to tracking the status of all of the JP-5 around the world, and a separate position is dedicated to F-76; in the Los Angeles office one person tracks all of the fuels, looking only at the Inland/West Coast region. This backup is important because if either office starts making plans that might cause unforeseen problems, the other office can bring those problems to light in time to make the appropriate changes. Also as a side note, DESC LA is also DFSP San Pedro. They have slightly different inputs to the system, but since most of the people are the same and just "wear two different hats," they are for all practical purposes the same organization.

5. Naval Petroleum Office

For our purposes, NAVPETOFF (the Naval Petroleum Office) is responsible for collecting the fuel requirements from the individual units via their chains of command, and passing those requirements to DESC. As a field activity of the Naval Supply Systems Command, NAVPETOFF is not usually involved in either the bidding process, or in delivering the fuel to the customers. However, the office does play a vital role, because the requirements they provide are an important factor in DESC's decision-making process. Also NAVPETOFF is involved with making the payments for fuel purchased at commercial and overseas facilities, such as a U.S. aircraft requiring fueling

at an Italian air base. This process is vital because there are many countries from which the U.S. military operates, and it would not be practical, economical, or in most cases even allowable for us to set up our own large scale fueling facilities everywhere we might need them.

NAVPETOFF's mission is to "Act as a technical and functional manager for all petroleum programs in the Department of Navy (DON), and to perform such other functions and tasks as may be assigned by higher authority." (Ref. 5) They work closely with, and are actually located across the hall from DESC in the Fort Belvoir Defense Logistics Agency building. Within NAVPETOFF, there are four main divisions. The Petroleum Systems Division of NAVPETOFF deals with fuel automated systems, automatic tank gauging, automated fuels handling equipment, petroleum policy, and fiscal and administrative functions. They also assist in documenting fuel specification problems and recommending solutions. The Facilities Engineering Division provides engineering and technical support for DOD fuel system construction, maintenance, and repair.

The Fuel Management Division oversees all Navy fuel programs, and acts as the interface between the fleet and DESC for all petroleum related issues. The Fourth division is the Resource Management Division. They oversee the resourcing and administration of NAVPETOFF, and act as a liaison between the civilian and military personnel and payroll offices, interpreting policy, developing and maintaining directives, administering the POL (Petroleum, Oil, Lubricant) Officer Intern Program, and managing

NAVPETOFF's Automated Data Processing program. In general, all four divisions work closely with DESC and DLA to support Department of the Navy fueling issues.

6. MSC and MSCPAC

Military Sealift Command's mission is to "Provide reliable and efficient sealift, combat logistics forces, special mission ships and maritime services to meet customer requirements." (Ref. 6) Both the evolutions of transporting fuel from refineries to the DFSP's via T-5 or contracted tankers, and then transporting the fuel to the end users afloat via T-AOs are covered under this mission. MSC, under the command of a U.S. Navy Vice Admiral, is a predominantly civilian organization, with "revenue center business plans, business support plans, and a corporate business plan." Therefore MSC carries out its operations considering both the customers' and MSC's interests. It is from that perspective that MSC works to provide the best possible service, in our case for possibly up to two of the links in the flow chain of fuel from producer to end user in the Southern California operational area.

Military Sealift Command Pacific (MSCPAC) is the administrative commander of the Pacific Fleet MSC oilers, including the San Diego based T-AOs, even when the oilers are operationally under the command of Commander Naval Surface Group Pacific North West (COMNAVSURFGRUPACNORWEST) or working for the Afloat Training Group Pacific (ATGPAC.) MSCPAC, working closely with and under MSC Headquarters staff,

also schedules and contracts the commercial "black hull" and/or T-5 tankers that supply various fuel depots, including Point Loma, with bulk fuel deliveries.

Prior to 1997, the decision was made to move MSCPAC headquarters from Oakland, CA to San Diego, CA. In the process of making the decision, Long Beach was considered as a possible site for MSCPAC, but the Submarine base in San Diego was finally chosen. The primary reason for this choice was that the MSCPAC headquarters and the ships themselves should be based close to the operational fleet concentration. Long Beach was, and still is viewed by MSCPAC and other organizations as a possible loading port, especially for JP-5, although this option has not been exercised recently with the T-AOs.

Considering further the MSC Headquarters staff in Washington, DC, they have responsibility above MSCPAC for the Contract tankers, T-5 tankers, and the T-AOs. The bulk fuels and tanker operations personnel at MSCHQ and DESCHQ work closely to ensure that the right quantities of fuel are at the right places at the right times in the most efficient manner. This close coordination is also evident in the relationship between DESC LA and DESCHQ, and MSCPAC and MSCHQ; all four offices are at least indirectly and directly connected in achieving the same goals.

When it comes to looking at contingency fueling evolutions, MSCPAC and MSC are important in evaluating whether possible options are viable. As such, they should be interested in the results of this study; if the fuel farm in San Diego is shut down for any reason, they will need to find an alternate source from which to fill up the oilers. The

coordination between MSC, MSCPAC, and the DESC offices will be an essential link in the flow of fuel to the U.S. Naval assets in the Southern California area.

7. Afloat Training Group Pacific (ATGPAC) and Commander Naval Surface Group Pacific Northwest (COMNAVSURFGRUPACNORWEST)

ATGPAC and COMNAVSURFGRUPACNORWEST will likely have some input if the requirement for an alternate fueling plan ever becomes a reality. However, they are closer to the end user than the supplier, so their inputs to the options chosen may have somewhat less impact than the inputs of key DESC and MSC personnel. Since the two groups are the primary operational commanders of the oilers when the T-AOs are operating off of Southern California, they will definitely be interested in where an alternate load port is located, and in the time/distance calculations from that point to where the MSC oilers need to meet the ships that they refuel or operate with. They work together to ensure that units operating from the Pacific Coast of Southern Mexico all the way up to Alaska are supported with fuel, mail and supplies. The two groups could have more input if some of the inport fueling options are used, or if the customer ships have certain needs or requests that are best coordinated between ATGPAC or COMNAVSURFGRUPACNORWEST and MSCPAC, and probably the T-AOs themselves.

8. The T-AOs

After considering DESC, DESCLA, MSC, MSCPAC, ATGPAC, and COMNAVSURFGRUPACNORWEST as the major players in the fuel delivery picture for Southern California, it makes sense to briefly discuss the T-AOs themselves. While they may not have the "big picture" information, these vessels do have more day-to-day contact with the customer ships, and are often more aware of the situational requirements for each of the ships. They also have the benefit of having Masters (Captains) who have been living and working in the maritime field for all of their careers. In some cases, the T-AOs Masters have been sailing as Masters with MSC for thirty years, and sailing altogether for closer to fifty years. To overlook their valuable insights in combination with the T-AOs daily discourse with the customer ships would take away an important asset that MSCPAC, DESC LA, and ATGPAC should exploit. The T-AOs may see an opportunity, overlooked by the higher offices, to more efficiently deliver fuel to the end users afloat off of Southern California in a contingency scenario.

9. Port Operations San Diego

The San Diego Port Operations Office actually played a smaller role in this research than originally anticipated, however they still will have some input to an alternate fueling plan in Southern California; and the findings of this study should be of some interest to them. The Port Operations Office in San Diego will be involved if Navy and MSC ships have to pull in to Long Beach or other Southern California ports, since

they coordinate much of those operations, even many of those not specifically in San Diego. In the event of loading T-AOs in an alternate port, San Diego Port Operations could actually benefit by having an extra deep draft berth available in San Diego on the days involved. San Diego Port Operations would have one less deep draft ship for which to find a berth, or one more open berth, on the dates when the T-AOs loaded in an alternate port. San Diego Port Operations would have to help ensure that all arrangements were made for the alternate port, especially those activities that would need to be shifted from San Diego to the alternate port, such as mail and stores deliveries.

10. San Diego "fuel farm," Point Loma

As the principal facility being discussed in this thesis, Defense Fuel Supply Point, or DFSP Point Loma plays a significant role in the flow of fuel from production to the end users afloat off of Southern California. Also known as Point Loma Fuel Department, DFSP Point Loma's combined 940,000 BBLS of JP-5 and F-76 storage will be essential to the Southern California fueling picture. (Ref. 7) While the potential catastrophes that could disable DFSP Point Loma will be discussed in this section C of this chapter, it is important to note that there are 50 bulk storage tanks, 30 miles of piping, and over 3000 valves within their 200 acre facility. All of these items play an important role in the overall operation of DFSP Point Loma.

In the event of a catastrophic failure of the fuel farm at Point Loma, the staff there will primarily be concerned with getting their facility back up and running as quickly as

possible. In cases where they still have some capability, such as the ability to load tanker trucks but not ships at the pier, they may have some role in transporting fuel to ships in port, but even as that is proceeding, their primary goal would be getting the fuel pier fixed, and their operational capabilities back to normal. While their inputs and ideas about the other options available would help, the decisions would largely be made at DESC and DESC LA, with the cooperation and concurrence of MSC and MSCPAC. Like DESC, DFSP Point Loma will benefit from this study by having a guide, and a starting point if they need to redirect the ships that are scheduled to refuel at their facilities.

11. USCINCPAC Joint Petroleum Office

USCINCPAC JPO is responsible for ensuring that adequate fuel storage and delivery assets are maintained within the Pacific Theater. (Ref. 8) They would be somewhat affected if DFSP Point Loma were disabled, especially if it happened in conjunction with a Battle Group, Amphibious Task Group or any large number of ships getting underway from San Diego enroute to the Western Pacific, Indian Ocean, or Persian Gulf. While the JPO is responsible for ensuring that adequate fuel storage and delivery assets are maintained within the Pacific Theater, (Ref. 8), this office would be especially concerned if the ships leaving San Diego did so without a full load of fuel due to a problem at DFSP Point Loma. The JPO does this by helping synchronize bulk fuel efforts, and ensuring that fuel support is available for Pacific theater operations. If the

ships were unable to get fuel on the way out from San Diego, USCINCPAC JPO would probably need to make sure that they received fuel in Hawaii or from an oiler operating out of Hawaii. Since they are responsible for the big picture fueling operations from Japan to Singapore to Australia to Hawaii, they would also work with COMLOGWESTPAC to ensure a second unrep for fuel and stores somewhere further west, most likely in the vicinity of Guam or Singapore. Operations further west are beyond this study. For our purposes, it is sufficient to say that if the ships depart San Diego on a transit of the Pacific, the USCINCPAC JPO would play an important role in ensuring that the ships received enough fuel at the appropriate points in their journey westward.

12. Commander, Naval Surface Force, U.S. Pacific Fleet (COMNAVSURFPAC)

Commander, Naval Surface Force, U.S. Pacific Fleet, or COMNAVSURFPAC, is responsible to the Commander in Chief, U.S. Pacific Fleet for ensuring that "surface ships of the Pacific Fleet are properly trained, maintained and crewed to support military operations with not only other U.S. Military services, but also friendly nations anywhere in the world." As such, they are concerned if there is some impediment to either the training or operational readiness of the units stationed or operating in Southern California. "Anytime, Anywhere - Because We're Already There" is COMNAVSURFPAC's theme, and being able to provide U.S. Navy ships that are able to deploy to anywhere in the world on short notice is a significant part of their business. If

the fuel farm at Point Loma were unavailable, COMNAVSURFPAC would definitely want to be assured that their ships would still be able to get the fuel that they need to train and to deploy as necessary. As such, they would most likely work through Afloat Training Group Pacific to verify that other options were being employed to deliver fuel to Southern California units afloat. As long as an alternate route was established for getting fuel to the end users, COMNAVSURFPAC would probably have minimal direct involvement in the Southern California fueling equation.

13. Commander, Naval Air Force, U.S. Pacific Fleet (COMNAVAIRPAC)

Like COMNAVSURFPAC, Commander Naval Air Force, U.S. Pacific Fleet (COMNAVAIRPAC) is concerned with equipping, training, and supporting all of the assets under their responsibility, and like COMNSVSURFPAC they report to the Commander in Chief, U.S. Pacific Fleet. With 6 Aircraft Carriers and almost 80 air squadrons with 1,600 aircraft assigned to COMNAVAIRPAC, this force would definitely be impacted by a disruption in the fuel flow through Point Loma DFSP. Also like COMNSVSURFPAC, they would not be involved in the details of the fuel flow from production to the carriers and planes, as long as a reliable alternate path could be established.

14. Commander in Chief, U.S. Pacific Fleet (CINCPACFLT) and U.S. Pacific Command (USCINCPAC)

Commander in Chief, U.S. Pacific Fleet (CINCPACFLT) supports U.S. Pacific Command's (USCINCPAC's) theater strategy, and provides "interoperable, trained and combat-ready naval forces to USCINCPAC and other U.S. unified commanders." CINCPACFLT provides the forces, and sustains and trains them for the unified commanders. Again, for our purposes, as long as the fuel flow chain is not stopped, albeit re-routed, CINCPACFLT and USCINCPAC will not be concerned with the details of how fuel is delivered to their 200 ships and 2,000 aircraft.

15. Commander, Third Fleet (C3F or COMTHIRDFLT)

Commander, Third Fleet (COMTHIRDFLT), like the unified commands is responsible for a wide range of tasks. In general, Third Fleet is concerned with deterring conflict, especially deterring attacks on the mainland U.S. from the sea. In addition to that mission, Third Fleet units help maintain a strong forward presence in the Fifth Fleet and Seventh Fleet areas of Responsibility. COMTHIRDFLT is also designated as a Joint Task Force Commander, and when operating as such reports to the Commander in Chief, U.S. Pacific Command for specific events or contingencies. Continuous training, maintaining, and supplying of Third Fleet assets are all important. As such, COMTHIRDFLT would be concerned with a disruption at DFSP Point Loma. Like COMNAVSURFPAC, COMNAVAIRPAC, CINCPACFLT and USCINCPAC though, COMTHIRDFLT would most likely not get involved in working out the details of the

alternate fuel routes, as long as those routes did not significantly impact their ability to conduct their operational and training evolutions.

16. United States Transportation Command (USTRANSCOM) and Military Traffic Management Command (MTMC)

USTRANSCOM is involved in DOD fueling evolutions, but mainly in a high level supervisory role. Their mission is to "provide air, land and sea transportation for the Department of Defense in time of peace and war." (Ref. 9) USTRANSCOM is a unified command that includes the Air Force's Air Mobility Command (AMC), the Army's MTMC, and the Navy's MSC. USTRANSCOM also acts as a liaison to the Maritime Administration (MARAD).

Under USTRANSCOM, MTMC "provides the Department of Defense worldwide single port management, transportation and traffic management services; deployment planning and engineering; and 21st century technologies." Like USTRANSCOM, MTMC would be involved in a somewhat supervisory role in the fueling issues in Southern California; the operational decisions would be made primarily by DESC, DESC LA, MSC, and MSCPAC.

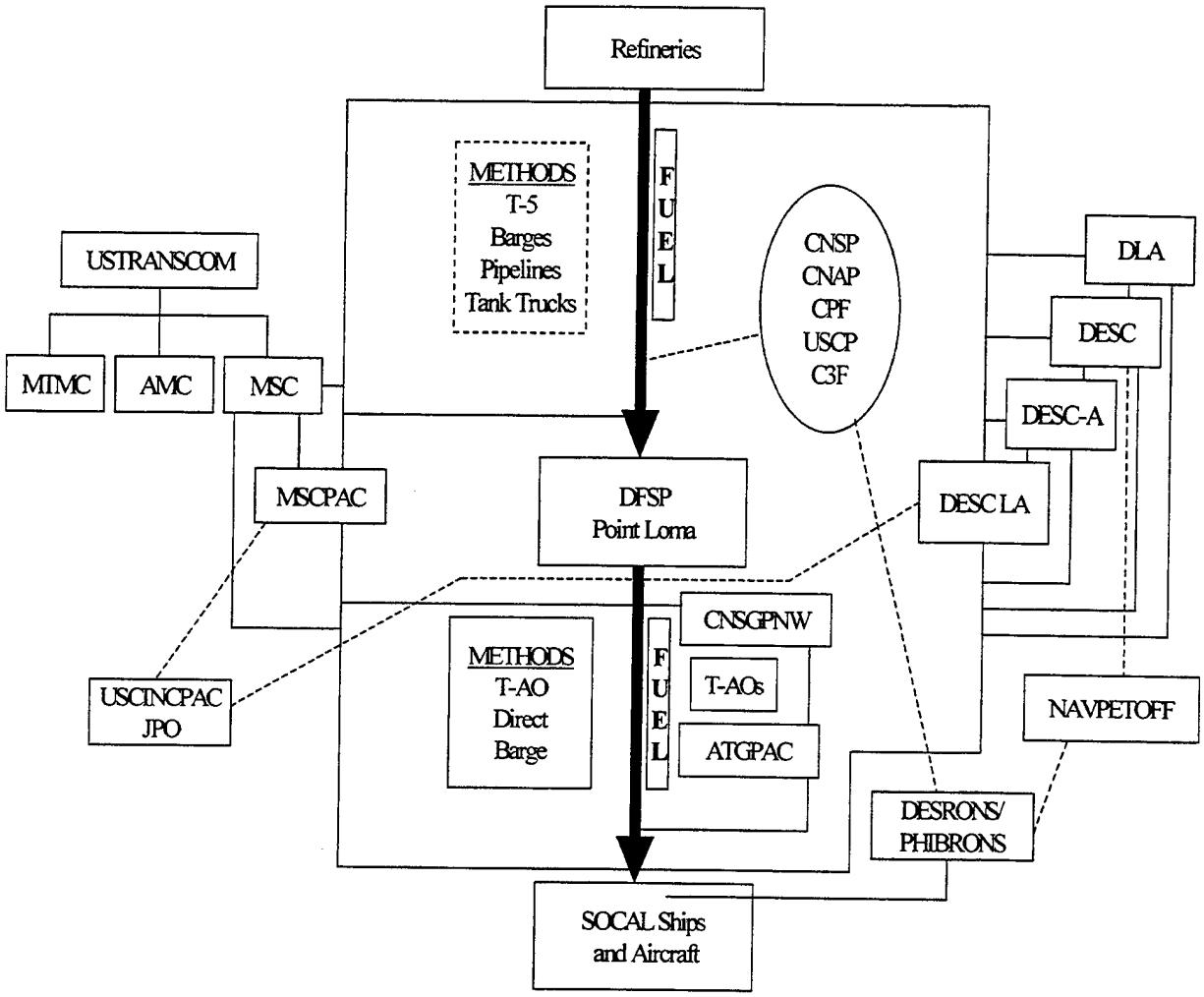

Figure 1. Fuel Flow Illustration From Production To End Users In Southern California

B. CURRENT FUEL TRANSPORTATION METHODS, ROUTES AND ISSUES

After looking at the various offices and organizations generally involved in Southern California fueling issues, it makes sense to now look more closely at the path that the fuel takes from production to end user, discussing the methods, routes, and other issues involved in getting the fuel to the ships and aircraft operating out of Southern California. This section of the study will summarize the fuel contracting process, and the Bid Evaluation Model (BEM). Then from that basis the methods for delivering fuel from production to end users in the Southern California region can be coherently discussed.

1. Contracting and the Bid Evaluation Model (BEM)

In contracting for the fuel, DESC takes into account a number of different issues. Of course price is the major factor, but the price determination includes transportation aspect. Some of the other factors involved are the additives needed, "storage terminal thru-put constraints, and offeror-submitted minimum quantity requirements." (Ref. 10) That is where the Bid Evaluation Model (BEM) is relevant. The BEM determines the "Lowest Overall Laid-in Cost" for the total supply of fuel, including delivery and multiple other cost factors to all of the locations in the given region. "It is composed of a Microsoft Foxpro application which provides data input and reports capabilities. This data is passed to the Ketron Management Science MPSII/pc package which creates a

mixed-integer linear programming (LP) matrix, solves the LP and passes the results back to the Foxpro application." (Ref. 11)

DESC starts the process by releasing a solicitation, based on the anticipated fuel requirements that it receives from NAVPETOFF for all of the various bases, stations, squadrons, ships, and other end users. Refineries and their associated companies then bid for the contracts. For each yearly bidding cycle there are multiple offers and multiple sources for each product. There are also multiple destinations for each product, other variable costs, including distribution cost components, and other options, including tiered cost structures, additive injection costs, and distribution costs for DoD's various petroleum fuel products. Even though an individual company may have the lowest bid for a certain destination, that company may not be awarded the contract or that quantity if that fuel is needed to meet the minimum conditions of another company's offer that would "result in lower TOTAL costs for the program." A mixed-integer linear optimization program was developed to take into account all factors in obtaining the lowest overall cost for delivered fuel. It is called the Bid Evaluation Model, or BEM. The BEM makes thousands and thousands of calculations to determine the most cost effective combination of contracts to be awarded.

The BEM inputs include all of the offerors and all of the requirement locations. From there, the model considers all of the different stipulations to each offer and to each location. It also looks at the price tier levels in conjunction with the other information. "Each offeror's product is evaluated to each location to which it can be moved." The

pairs are arranged and rearranged and rearranged, examining each pairing of supplier price tier, transportation method cost and user until the optimum mix is found (lowest overall price, fulfilling all of the requirements of both suppliers and users). The output from the BEM "determines the successful supplier for each destination and how the fuel should be delivered to the destination through the network. The aggregation of the solutions for all destinations is the minimum cost solution for the purchase program" for that region.

It is important to reemphasize that a company that offers the lowest price for delivering a certain amount of a certain product to a certain destination, may not in reality end up receiving the bid for that delivery if there is another company who can, by making that delivery, give an overall lower cost solution for the entire set of contracts for that region. The BEM is the key program that determines that lowest cost solution. With all of these aspects in mind, it is not surprising that fuel suppliers can shift from year to year, based on the best overall value for the government. While it may risk offending providers that have repeatedly received contracts over multiple years and suddenly get under bid by a very narrow margin, keeping competition in the system also serves to increase efficiency in the civilian sector for these companies. (Ref. 12)

2. Current methods of getting JP-5 and F-76 from production sites to afloat units

The primary fuels that the Navy uses for both its aircraft and ships in the Southern California operational area, JP-5 and F-76, are refined mainly in the Washington, San

Francisco, and Long Beach areas. They are then sent via numerous means to the fuel farm at San Diego (DFSP Point Loma) where the oilers load it and take it to the Navy ships at sea. The first method of delivering fuel to DFSP Point Loma is by tanker ship, either contracted tanker or a tanker that is "voyage chartered," or basically rented for that trip. The second method is by barge; the third is by pipeline; the fourth, and less practical because of the large quantities involved, is the tanker truck. Once at Point Loma the fuel is transferred to the ships, usually via a T-AO, but sometimes via direct onload at the fuel pier, or occasionally a fueling barge. For each of the methods it is extremely important that the end users and storage facilities all attempt to give as accurate predictions of the amounts of fuel that they will use in the following months to keep from having a situation where either someone runs out or a delivery shows up and there is not enough room to store it. Without accurate predictions, MSC and DESC have a difficult time scheduling deliveries by tankers and barges. The following paragraphs examine both of the major legs of the fuel's journey from production to end users, and look at the different transportation methods for each leg.

The primary method of delivering JP-5 and or F-76 from refineries in Washington and San Francisco to San Diego is a tanker ship. The distances, costs and environmental considerations involved often make tanker ships more attractive than a pipeline, and the speed and quantity difference makes them more attractive than barges. Furthermore, it would not be economical to set up a pipeline for a company that wins the contract this year, since they might not win the contract next year.

In looking at the refineries in the greater Los Angeles/Long Beach area, there are more options for transporting the fuel to San Diego. The tanker option is still very attractive for its speed and lower environmental risks. However, with the shorter distance, barges have been used more frequently than tankers in recent years. Barges can be scheduled with a significantly shorter lead-time, and barges do not detract from the regularly scheduled runs of the T-5 and contracted tankers. The last main method is the pipeline to San Diego. Pipelines have come under increasing attack from local elected representatives in the past few years, because they do not want DOD fuel lines running through their districts. However, the pipelines are a very efficient way to get fuel from the Los Angeles area to San Diego, and their use requires less coordination than contracting a barge or scheduling either a T-5 or contract tanker.

Once the fuel is delivered to San Diego, the last leg of the fuel's journey is to the end user ships and aircraft. In most cases, this final leg involves taking the fuel from the tanks on Point Loma and loading it into Navy and MSC oilers to be delivered to the Southern California based Navy ships and their associated aircraft. Having the oilers take the fuel from the fuel farm at Point Loma reduces the number of fuel transfer evolutions that occur in port, thus reducing the chances for a spill or other catastrophe. It also puts the oilers crew experience experience of the crew's of the oilers to best use; transferring fuel is their primary job, and not just a collateral task as it is for crews on regular USN ships.

However, there recently have been significant improvements in the training and capabilities of the crews on the regular USN ships to transfer fuel efficiently and safely. This leads us to the other method of delivering fuel to the ships operating in the Southern California area: in-port refueling. While this has been restricted by direction of Third Fleet for environmental reasons, special permission is occasionally given to transfer fuel to ships either by barge or directly from the fuel pier, especially ships coming out of maintenance or dry-dock periods in which their fuel tanks were emptied.

3. Summary

This section of Chapter II examined the most common methods of delivering fuel from the West Coast refineries to DFSP Point Loma, and from there to the end user ships and aircraft. Transportation issues were addressed after discussing the Bid Evaluation Model and the contracting process for procuring fuel in Southern California. That background information placed the transportation issues in the proper context.

C. REASONS FOR HAVING CONTINGENCY PLANS

As discussed, the Defense Fuel Supply Point at Point Loma is a key link in the flow of fuel from production to the end users afloat in Southern California. From that standpoint, there are a number of reasons for having contingency plans. Having backup plans in case problems develop will be important to maintaining the day-to-day operations of the Navy assets in Southern California, and could be vital in case of a National emergency or overseas crisis to which the U.S. Navy is required to respond. We

will discuss and analyze the different options in Chapter III, but this section summarizes different reasons why it is important to have and develop those options. These reasons actually explain why this research is important. If it were not for all of the potential problems, we would not need to develop and analyze various options for transporting fuel to the Navy units operating off Southern California.

This section will also look at the impact that Base Realignment And Closures, or BRACs have had on the Southern California fueling situation. This will be important as we go into the last part of this section, which discusses the requirements for both short and long term evolutions in Southern California. This discussion will consider what evolutions would be affected in the short and long term if DFSP Point Loma was not available due to one or more of the problems examined.

1. Possible Disabling Catastrophies

a. Earthquake

In Southern California, earthquakes happen quite frequently. Between 1901 and 2000, there were one hundred and fifty five significant earthquakes in California that measured between 5.2 and 8.25 on the Richter scale, or on average a significant earthquake somewhere in California every nine months. This does not include the thousands of smaller earthquakes, foreshocks, and aftershocks that can be, and have been quite damaging. (Ref. 13) This is especially significant when looking at the DFSP on Point Loma, because there is a fault line that runs right through the facility. In the

event of an earthquake along that fault, there could be significant damage to the 50 bulk storage tanks, 30 miles of piping, and over 3000 valves, not to mention the pumping facility and the pier itself. While it is true that there are hundreds of fault lines running all through Southern California, it would not take a very severe earthquake to cause a lot of damage to the DFSP if the earthquake happened to be on the underlying fault line. Depending on the severity of the damage, it could take days, weeks, or even months to repair and clean up the damage.

b. Catastrophic Failure at the Pumping Station

The pumping station at DFSP Point Loma is another point at which potential problems could arise. If the pumping station were to be incapacitated either mechanically or electrically, it would limit the capacity to pump fuel to the ships, although with the proper alignment and sufficient time, much of the fuel could be gravity fed to the ships at the pier. Even if the pumping station was totally unuseable, emergent repairs could probably be conducted to get it back up and at least minimally operational at some level within a few days to a week.

c. Terrorist actions

Terrorism is one of the most significant threats in today's environment. At DFSP Point Loma, a terrorist could conceivably bomb part or all of the facility, thus rendering it unusable for periods starting from days and possibly stretching out to years, depending on the location and extent of the damage. According to the State

Department's reports on "Patterns of Global Terrorism," in the years 1990 through 1999 there were over 3400 significant acts of terrorism, killing thousands of people and severely wounding tens of thousands more. With terrorism being used by many countries and organizations today, it is important to look at what impacts a terrorist attack could have on DFSP Point Loma.

While it would be a lot more difficult and have less 5 o'clock news worthy impact, a terrorist could contaminate the fuel tanks at Point Loma. Contamination would take the affected fuel tanks off line, thus reducing the overall capacity for fuel at DFSP Point Loma. Unless they were to get most or all of the tanks without being detected there would be limited impact from only taking a tank or two off line. With frequent fuel testing while the fuel is in storage and definitely before it is transferred to the ships, the terrorists would have to contaminate the tanks undetected and also hope that the fuel made it undetected through the testing procedures at the fuel farm and on to the ships, which would not be probable.

d. Nuclear or Conventional Bombing

If there were to be another World War, San Diego would definitely be fairly high on our enemies' list of potential targets, and then DFSP Point Loma would be fairly high on the list within San Diego. When the Japanese bombed Pearl Harbor on December 7, 1941, they sunk or severely damaged many of the U.S. Navy ships that were in port at the time. However, since the carriers were not in port the Japanese did not get

them, and for some reason the Japanese did not target the repair facilities or the fuel tanks. These three failures allowed the U.S. to get back into the War in the Pacific a lot faster, a lesson which our future enemies might take into account as they planned their attacks on U.S. ports.

Whether an attack on San Diego and Point Loma came by conventional or nuclear bombing, the damage to the fuel farm could be quite extensive, again taking anywhere from days to years to repair. Depending on the extent of the damage, the cost of repairing the fuel farm could be beyond feasibility, and one or more of the options that we will discuss in chapter three would have to be turned into the new primary method of getting fuel to the Southern California ships and aircraft at sea.

e. Ship or Aircraft Collision with Pier

The next potential problem that could occur at DFSP Point Loma is a major collision between a ship or aircraft and the pier. The 964 foot long fuel pier is located at such a point in the harbor that ships have the potential for running into it, especially ships exiting the harbor. As ships exit the harbor, the fuel pier is on their right side as they come around a bend in which they are turning to the left. If for some reason a ship were to either take the turn too wide or loose steering partway through the turn the ship could easily collide with the pier. The risk is greater during times of the year when thick fog coming into the harbor from the ocean, significantly increasing the chances of

collision. Whatever the reason, the ensuing collision with the fuel pier could take anywhere from days to months to repair.

Similar to a ship colliding with the fuel pier is the scenario of an aircraft crashing into the pier. While it may sound a lot less probable there is a reason to look at this situation as a real possibility. The first reason is the proximity of the fuel pier to the air field at North Island. Being located just across the channel from the air field significantly increases the possibility of a potential problem. Then add to that the fact that many fixed wing aircraft on their final approach to North Island often make a sharp turn almost directly above the fuel pier, and the fact that many other rotary wing aircraft (helicopters) transit the harbor right above the shipping channel and you can see why there is reason for concern. If you add to that the fog issue, you can see how it is within reason that a collision between an aircraft and the fuel pier could once again cause damage that would take days, weeks, or months to repair.

f. Fuel Contamination

One of the possible problems touched on earlier was the possibility that the fuel tanks could be contaminated. Whether it is through terrorist actions or from an earthquake causing tank linings and walls, sand, dirt, and other debris to get into the fuel, there is the chance that some or all of the fuel tanks at Point Loma could be contaminated. While some contaminants can be settled out by just basically letting the fuel sit long enough to let the contaminants to either float or sink to the bottom, there might not be

enough time or tank space to allow for that. If many of the tanks were damaged in an earthquake, the top priority might be just getting the fuel out of the cracked or otherwise damaged tanks. Another thing to keep in mind in terms of contamination is that there are some chemicals that would not just settle out as easily. If some of these chemicals were introduced into the fuel tanks, the tanks affected would no longer be of use until they could be emptied and cleaned. Even then there would still be the issue of what to do with the contaminated fuel, and again part or all of the fuel tanks at DFSP Point Loma could be out of commission, possibly causing days, weeks, or months of repairs prior to being able to use the facilities again.

2. DFSP Point Loma Fuel Capacities

As has been emphasized numerous times, DFSP Point Loma is an important link in the Southern California fuel flow chain of from producers to the end users. The next section examines the importance of this facility in raw numbers, and then puts some of those numbers into perspective. First, we will consider the amount of F-76 and JP-5 storage available at Point Loma. According to the Bulk Petroleum Terminal Message Report, or the DLA 1884 Report (which lists only 95% of the total capacity), there is currently storage for 567,000 BBLS of F-76 and 373,000 BBLS of JP-5. Note that the average amount of fuel delivered by DFSP Point Loma to their various customers per year was 3,484,000 BBLS for Fiscal Years 1998, 1999, and 2000, and that average receipts per year over the same three-year period were 3,632,000 BBLS. Most of the

fuel, an average of 2,237,000 BBLS, was delivered to the oilers, or almost two thirds of the issues. Looking at it from a slightly different perspective, DFSP Point Loma issued approximately three and two thirds times their holding capacity to all of their customers per year, or over two and one third times their holding capacity to the oilers alone per year during this three-year period. Incidentally, during this same three-year period, the amount of fuel that the oilers requested and the amount that they onloaded differed by an average of 580,000 BBLS per year, which could also have a direct and significant effect on the amount of fuel available at DFSP Point Loma. While most of these differences are due to changes in the amounts of fuel requested versus actually taken by the customer ships, which can not be helped by the T-AOs, it is still an important issue to keep in mind.

Another significant participant in the flow of fuel into DFSP Point Loma is the T-5 Tankers. In terms of inputs or re-supplies, each T-5 tanker typically carries approximately 220,000 BBLS; if T-5 tankers alone were used to re-stock the DFSP fuel tanks, it would take over four full T-5 loads to refill the fuel farm once, and sixteen and a half loads to complete a full year's re-supply (based on average of FY 1998, 1999, and 2000 numbers). In terms of output, the number one customer group that is issued fuel from DFSP Point Loma is the San Diego based Oilers. In FYs 1998, 1999, and 2000, the average combined amount of fuel issued to the Oilers from DFSP Point Loma was 2,237,333 BBLS per year.

To put that number into perspective, oilers would have to complete over twelve full loadouts in one year, based on the T-AO capacity and assuming full loadouts, which almost never happen. As a side note for the discussion in this chapter, we should note that the typical tank allocation onboard the T-AO is 60% F-76 and 40% JP-5. This has minimal impact on the fuel transportation issues, but is good to consider for planning purposes. Another way to look at it for pure comparison reasons is that using a T-AO, it would take over twenty full loads to carry the amount of fuel that DFSP Point Loma uses in one year (again, based on average FY 1998, 1999, and 2000 numbers).

(Also, numbers based on cargo capacity of T-5s being 238,400 BBLS maximum, but typically only loading to 220,000 BBLS, and cargo capacity of T-AOs being 180,000 BBLS.) (Ref. 14 and 15)

In comparing the T-5 capacity to the T-AO capacity, in just five times pulling into Long Beach for a full loadout of F-76 and JP-5, the T-AO could eliminate four typical trips for a T-5 tanker from Long Beach to San Diego, or alternatively eliminate the costs of moving the equivalent fuel to San Diego from Long Beach via pipeline. The T-AO would be loading in San Diego or an alternate loading port on many weekends anyway, and would be pulling in somewhere for food and provisions too, so the cost of the tugs, pilots, shore services, etc would be required regardless of the port that they pull in to.

However, additional coordination would be required for onloading JP-5 at the Mole Pier in Long Beach, and arranging to onload F-76 at the commercial F-76 facility (assuming that a Long Beach company has a contract for F-76 that year), as well as

delivering of mail and supplies and conducting maintenance in conjunction with San Diego based organizations. These issues will be discussed further in Chapter Three, which looks at the various options available instead of DFSP Point Loma.

3. BRAC Discussion

During the 1990s drawdown under the Base Realignment and Closure (BRAC) program, numerous U.S. Department of Defense bases and fueling facilities were shut down throughout the world. Of particular importance to this discussion, was the closing of the Long Beach Naval Station, and the eventual discontinuing of storing and issuing F-76 from DESC Los Angeles/DFSP San Pedro. While DFSP San Pedro still is a storage and issue point for JP-5, the former F-76 tanks have now been cleaned and converted to store other fuels, including JP-5.

In terms of contingency plans, the 1991 BRAC Commission decision to close the Long Beach Naval Station, and the further 1995 decision to close the adjoining Naval Shipyard both had a significantly negative impact on Third Fleets ability to respond to crisis situations. Closing the shipyard gave Third Fleet one less place to repair Third Fleet ships, removed the most profitable yard, and removed Drydock No. 1, which was one of only two drydocks on the West Coast that could handle any ship in the Navy. (Ref. 16) But of more relevance to our discussion, closing the base and shipyard removed Long Beach as an alternate fueling port under normal circumstances. It would currently require special coordination to load a ship with JP-5 in Long Beach, and it is

questionable whether a ship could load F-76 there at all. For all practical purposes, there is no standing back up fueling facility if DFSP Point Loma is significantly disabled or degraded. Looking at it in those terms, it is diffucult to understand the rational for the BRAC commission's decision to close the Long Beach Naval Station and Long Beach Naval Shipyard.

4. Short and Long Term Evolutions under Crisis and Normal Scenarios

As a basis for looking at options that would be available in case DFSP Point Loma was out of service, we first need to discuss different possible scenarios. The first element of all these scenarios is the assumption that DFSP Point Loma has been taken out of service. From there we look at whether DFSP Point Loma is going to be Out Of Commission (OOC) for days, weeks, months, or even years.

If we decide that it will be OOC for days or weeks, short-term work arounds can be developed to deliver the necessary fuel to units in the Southern California Operational Area. On the other hand, if the fuel farm will be disabled for months or years, we would want to immediately start developing alternate large scale and sustainable plans to deliver fuel to the Navy ships and aircraft in Southern California. The other two aspects to the fueling scenarios are whether the contingencies involve a crisis scenario, or normal operational schedules. For our discussion purposes, a crisis scenario is one under which one or two battle groups or ARGs are required to get under way with short notice to support pressing U.S. interests in a conflict or war. As these units get under way, there is

a good chance that they would need, or at least desire a full load of fuel as they left the west coast of the United States. The normal operational schedule is the last scenario that would need to be supported under the scope of our discussion. A normal operational schedule includes all of the training and deployment "work ups" that ships and aircraft perform day-to-day. Supporting these evolutions, while important, would usually take a back seat to any emergent issues. Supporting normal operations would tend to be more flexible than scrambling to get fuel to Battle Groups or ARGs that are deploying on short notice. It is important to keep all four of these situations in mind as chapter three will analyze the different fueling options available in case DFSP Point Loma is disabled.

D. RELEVANT LITERATURE AND DOCCUMENTATION

Before analyzing the options, discussing the findings and giving conclusions, it is appropriate to briefly discuss the sources of the information used in this study. While the Bibliography, List of References, and Acknowledgement pages all give the appropriate credits, it is important to at least briefly discuss these sources, and the impacts that they had on the research.

1. Library Materials and Charts

Initially in this research, much of the information came from the various sources available in the Dudley Knox Library at the Naval Postgraduate School. From the outset of the research, the librarians have been extremely helpful in not only directing me to useful sources, but in helping me get copies of those sources that were not locally held.

Some of the other sources of library information included assets such as prior theses and reference material, the books and charts listed in the Bibliography, and the electronic resources. Altogether, the support from the library was vital to the end product of this thesis. Without the information obtained through the library at all stages of the research, the end product would not be as significant and meaningful.

2. On-Line Materials

In terms of online material, most of the significant players that we discussed in the "Relevant Offices and Organizations" section had web sites that proved extremely helpful in describing their expected roles in the Southern California DOD Fueling issues. The online sources facilitated setting up and coordinating the interviews conducted, both on site and over the phone. Some of the referenced manuals came directly from online sources, and others were referred by the online sources. While many of the details or numbers were not available online, the web sites at least indicated the right direction for getting the information and points of contact needed.

3. On-Site Materials

Some of the key areas that are relevant to the discussion include the quantities of fuel involved and the capabilities of the alternate loading ports. Much of the fuel information came from materials that were provided during visits to DESC LA, DESC Headquarters, and DFSP Point Loma. Much of the reference material used in building this thesis came directly from the material provided on-site. Without these materials,

much of this thesis would be opinions and vague statements, with few hard facts and numbers to back them up. The materials accessed during on-site visits play an important part in making this thesis a more significant and useful document.

4. Information from Interviews

Interviews, both on site and over the phone, proved to be a very significant source of information in this research subject, especially in developing all of the alternative options. The interviews revealed most of the alternate fueling solutions, and the interviews also provided a much better understanding of the issues involved. It was indeed a humbling experience to talk to the experts who have been dealing with fueling issues around the world for, in many cases, twenty years or more in one capacity or another. Their willingness to teach me about how the DOD fueling system works was valuable not only to this research, but to my personal and professional development. I cannot fully express the positive impact that they had on the outcome of this project. I hope that the end product will not only be an accurate depiction of the Southern California fueling situation and options, but also a document that will provide value to those who were so vital to its creation.

E. CHAPTER SUMMARY

Chapter two has given the background from which we can coherently discuss Southern California fueling issues, especially those involved if DFSP Point Loma is disabled. We first looked at the relevant offices to better understand exactly who is

involved and affected by the Southern California fueling issues. We did this by discussing the current flow of fuel from refineries all the way to the end users, and looking at the coordination between the various offices. Along with the flow issues, we discussed the fuel contracting and bidding process. The last two subjects covered in the second section include the amount of JP-5 and F-76 delivered to Southern California units on a yearly basis, and the transportation methods used for these deliveries. These were examined with respect to quantitative numbers to provide a clear picture of the fuel quantities involved.

In the third section, we looked at the various reasons that make it important to have a contingency plan, and showed how there are numerous problems that could disable DFSP Point Loma for periods from hours to days to years. In conjunction with discussing the potential problems, this section also looked at the negative impact that BRACs have had on the Southern California fueling situation and discussed why the BRAC Commission's decision to close Long Beach Naval Station and Shipyard was such a poor choice in terms of fuel delivery and flexibility. This was important in the last part of this section which discussed the requirements for both short and long term evolutions in Southern California. This discussion was approached from the aspect of what evolutions would be affected in the short and long term if DFSP Point Loma was not available due to one or more of the problems examined. In section four of chapter two, the information that is covered in the Bibliography, List of References, and Acknowledgement pages was discussed briefly because of the important role that

materials from the library, on-line, on site sources and interviews all played in making this a more valuable and useful study.

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III. ANALYSIS OF OPTIONS

A. INTRODUCTION

Chapter three contains the central contribution of this thesis. The introduction and background chapters described the basic issues involved with the Navy fueling picture in Southern California, from the different organizations involved to the current fuel transportation methods to the reasons for having alternatives to DFSP Point Loma. This chapter analyzes many of the different options available. While this chapter does not discuss ALL of the different options, this list of options developed with the aid of DESC, DESC LA, MSC, MSCPAC, DFSP Point Loma, and the other organizations, is fairly comprehensive, and the analysis here in can be used as a basis from which to look at other options, which may become available.

Before we get into the options, we should briefly discuss the BEM again. If contracts were in place for certain quantities of fuel from certain refineries to certain destination DFSPs, running the BEM would be a lot easier, because there would be fewer variables and more constants. However, the BEM would still be an important part of the decision making process, especially if there were new options included that were not originally considered in that year's contract.

In looking at the various options, each one is analyzed by looking at the same aspects. The following is the basic breakdown of the different areas analyzed for each option, of course with variations for each option as appropriate. The cost/savings

analysis used the costs of DFSP Point Loma as the common reference point for comparison across all of the options. If DOD had to implement one or more of these options it would probably mean that DFSP Point Loma was not available. Nevertheless, using it for comparison is still useful. Also note that some areas considered as positive aspects for one option may be negative or incidental aspects for another option, and vice versa.

A. Introduction and description of option
B. Positive aspects, impacts, benefits, advantages
    1. Reduction in double handling of fuel
    3. Safety
    4. Time savings
    5. Cost savings
    6. Improve San Diego berthing situation
    7. Provide another option in case of a crisis or contingency
    8. Readiness
    9. Other
C. Negative aspects, impacts, costs, drawbacks
    1. Operational schedule (including time/distance)
    2. Admin support
    3. Supply support
    4. Maintenance Support
    5. Other
D. Incidentals and other issues
    1. Port and service costs
    2. Security
    3. Tugs and pilots
    4. Fuel capacity and capabilities of alternate solution/port
    5. Historical capabilities and usage
    6. Current capabilities and usage
    7. Future possibilities for capabilities and usage
    8. Other effects on the ships
    9. Other offices/areas affected
E. Cost Savings Analysis
    1. Introduction
    2. Areas accounted for (both costs and savings)
    3. Numbers for option versus DFSP Point Loma

4. Impact in terms of personnel, equipment, and dollars
5. Other
6. Bottom line for Cost Savings Analysis

F. Implementation

For reference, a summary of the various options discussed in this chapter can be found on the last page of the chapter. It states the critical aspects of each option.

B. OPTION 1: LONG BEACH

The port of Long Beach has a long and rich history with the U.S. Navy, from the Navy ships anchoring there in the 1840s to the 1908 visit of President Theodore Roosevelt's Great White Fleet, to the Persian Gulf War when numerous U.S. ships were home ported there, including two of the last four Battleships. As such, Long Beach had, and to a certain extent still has, the capability to support U.S. Navy fueling needs in the Southern California area. Since the closure of the Naval Station in 1991 and the Naval Shipyard in 1997, however, the use of the remaining facilities by Navy ships, both USS and USNS, has been somewhat limited.

This does not mean though that the capabilities are not there. Currently, the Mole Pier on what was formerly the Naval Station is used by the T-5 and contracted tankers and barges to onload JP-5 from DFSP San Pedro for delivery to various ports, including San Diego and Pearl Harbor. If a T-5 can pull in to the Mole pier, there is no reason that a T-AO could not. It would be primarily a matter of coordination. However, loading F-76 in Long Beach would currently be a little trickier. The first issue is that there is no

longer a DFSP that has F-76 tanks or lines to Long Beach. That means that F-76 would have to be loaded directly from a commercial company or barge onto the USS or USNS platforms. This assumes of course that there is a company in the LA/Long Beach harbor area that has won a portion of the F-76 contract for that year. If there is such a company, as there is in FY 2001, then this would be a reasonable alternative, although there would be some significant issues to consider in arranging the onload evolution. These issues will be the bulk of the discussion in the next few paragraphs.

First, consider the positive aspects of loading ships, especially the T-AOs, in Long Beach. One of the biggest benefits would be reducing the double handling of the fuel. Currently JP-5 is taken from the Mole pier and F-76 is taken from the GATX Terminal via T-5 tanker or barge (GATX is a sub-contract of the Paramount refinery that is contracted this year to produce 100,000 BBLS F-76 per month). The fuels are then transported to San Diego to offload to DFSP Point Loma, and then further onloaded to either the T-AOs or the end user ships. Having the T-AOs pull in to Long Beach directly would save some of the onload and offload costs, but also reduce the chance for oil spills. Basically, the more times that you handle a fuel, the more chances there are for a spill. This environmental safety benefit would be in addition to the cost and time savings that would accrue by not having to handle the fuel twice or transport it from Long Beach to San Diego. Finally, loading fuel in Long Beach when DFSP Point Loma was not available would free up at least one, but possibly two deep draft berths in the crowded

San Diego harbor. All of these benefits together would combine to have a significant positive impact on the readiness of most of the ships and aircraft in Third Fleet.

Next, consider the negative aspects of having ships load JP-5 and F-76 in Long Beach if DFSP Point Loma is not available. In terms of operational considerations, Long Beach is about forty-five minutes further away than San Diego from the normal area in which the T-AOs operate. This would come into play on the first and last refueling evolutions of the week, since either they would have to start the first evolution about an hour later and end the last evolution an hour earlier, or the T-AOs would have to get underway earlier and come in later. Also considering some of the Afloat Training Group taskings and evolutions that end up being just twenty to thirty minutes outside San Diego harbor, these taskings would probably be affected to a certain extent, even if the T-AOs were to get under way earlier and pull in later.

Looking next at administrative support for the Long Beach option, the closest Navy and MSC offices are in the San Diego area. When the ships pulled in to Long Beach, they would probably need a van to run people and the paperwork that could not be processed electronically to San Diego. Vanloads of people are currently driven back and forth between wherever the T-AOs dock in San Diego to both PSD on the 32nd Street Naval Station and the MSCPAC Headquarters building on the Sub Base at Point Loma. The increased driving distance from Long Beach harbor to San Diego could be a minor drawback. Lastly, there could be an issue of vapor recovery systems on the loading ships. Recently when arrangements were being made to possibly even pull a T-5 into the GATX

terminal, the vapor recovery systems became an issue, although it was resolved in time for the onload.

The next two negative aspects can be discussed together, since they could often rely on one another. When a San Diego based ship pulled into Long Beach, it would definitely have a harder time getting maintenance and the supplies to do that maintenance. Since there is no longer a Naval Station or a Naval shipyard in Long Beach, most Navy maintenance shops are now based in San Diego, co-located with the fleet concentration. Getting tech-reps, parts, and maintenance supplies from San Diego over a weekend, when the T-AOs usually load, could prove difficult. Even arranging for the delivery of regular supplies, mail, stores, parts, and new crewmembers could be a challenge. In general, most of the negative aspects are all linked to the distance between Long Beach and San Diego.

Incidentals for pulling a T-AO into Long Beach can be considered negligible, but we can touch on them briefly for familiarization. Considering port service costs, the Mole pier in Long Beach actually has no hook ups. This avoids port service costs, although it would mean that the ship's generators, sewage holding system, cell phones, and fresh water tanks would all be utilized more. This is not a real savings, though, since the same amount of services would still be used, just provided from sources mostly internal to the ship.

Security guards are one aspect that people could possibly overlook. If a T-AO pulled into Long Beach, there would need to be a security guard at the head of the pier to

ensure that only essential personnel were allowed on the pier. This same requirement was solidified at the fuel pier on Point Loma in 1998, and there the security guard at the gate to the fuel facility was only required when there was a ship at the pier. This guard supplements the gate guard at the base enterance, which there would no longer be at Long Beach.

In looking at the tugs and pilots required for docking in Long Beach, they too can be considered somewhat negligible since the ships would need tugs and pilots if they were docking in San Diego. Although there are dedicated contracted Navy tugs and Navy contracted pilots in San Diego, a pilot and tugs cost about the same amount even if they are paid out of someone else's pot of money. The fuel capacity at Long Beach is another aspect to consider. Since DFSP San Pedro has converted all of their tanks that used to hold F-76 into JP-5 and JP-8 tanks, there should be no shortage of JP-5 from the Mole pier (DFSP San Pedro still has the JP-5 pipeline running to the Mole Pier) if it is needed. The F-76 could be a little more difficult. If there is an F-76 supplier in the Long Beach area, as there happened to be in the 2001 contract, then it could be possible to have the T-AO get F-76 directly from the supplier. If this were to happen under the 2001 contract, the company providing the fuel would be the Paramount Refineries, who have sub-contracted holding tanks at Long Beach harbor from the GATX company. In pulling in to the GATX terminal, the T-AO would preferably be almost out of F-76, since both the refinery and GATX would prefer to deliver larger quantities at a time.

Getting F-76 at GATX could also be a problem if Paramount had recently delivered a large quantity onto a barge or tanker for DFSP Point Loma or another DFSP, since their production capacity is limited each month according to their contract. If the refinery had produced enough fuel to put them on or ahead of their delivery schedule, then they might not be planning to fill the GATX tanks very soon. If there was no F-76 in the GATX tanks, it would take more advance notice, and some contract negotiation, to get Paramount to provide more fuel and/or sooner. Lastly, the ships would probably need to coordinate onloading the F-76 before loading the JP-5, since the GATX terminal is on the inland side of the channel between Terminal Island and the main land, and there could be more of a draft concern.

As was stated earlier, Long Beach has a long history of supporting the Navy. The port and DFSP San Pedro were capable of keeping all of their home ported ships ready and fueled. Since the base closed and the F-76 tanks and pipeline from San Pedro were shut down, it has significantly hindered using Long Beach as an alternate loading port for F-76, but did not eliminate it. The biggest questions are how much fuel is ready and sitting in the contractor's tanks (Paramount/GATX this year), and how flexible they can be in arranging to transfer the fuel to the T-AOs. Under this year's contract, the Paramount refinery is contracted to provide effectively nine barge loads, at 120,000 BBLS per barge.

In terms of future possibilities for using Long Beach as an alternate loading port, it will rely on two factors. The first is maintaining DFSP San Pedro's ability to store JP-5

and their ability to deliver it to the port (Mole Pier) via pipeline. Keeping that ability will be vital to the readiness of Southern California Navy units, especially in the event that DFSP Point Loma becomes disabled. The second factor is maintaining an F-76 refinery in the Long Beach area. Whether it is a constraint in the BEM or incorporated as a separate issue/contract, it could become extremely valuable in a contingency evolution.

Now it is time to discuss the cost/savings issue. While the actual dollar amounts for the Long Beach versus the Point Loma option were somewhat elusive, we can still discuss in general terms some of the costs versus the savings involved. The savings over using Point Loma include: reducing fuel double handling, eliminating the cost of transporting the fuel from Long Beach to San Diego, and, to a lesser extent, reducing costs while in port, since the Mole pier does not have pier services such as shore power, sewage, fresh water, or phone connections.

The additional costs over using DFSP Point Loma would be in a number of areas, but would not cumulatively outweigh the cost savings. First, there would need to be a shuttle set up to run people and paperwork back and forth from Long Beach to San Diego. There would also be costs to transport the ship's mail, stores, and maintenance material/personnel from San Diego. While tugs and a pilot would have to be used in both ports, there is less Navy activity in Long Beach. Thus, there might be higher costs per evolution (entering port, shifting piers, leaving port) than there would be in San Diego. Since security guards would be required at either port, that aspect of the costs can be ignored. Lastly, there would be slightly longer transit times from Long Beach to the

typical T-AO operating area, and slightly increased ship's operating costs in terms of fuel burned, extra hours of pay for watch standing, etc. Altogether, the savings accrued by pulling the ship directly into Long Beach would greatly outweigh the potential costs.

When it comes to implementation, there would need to be some coordination with the LA DESC office (DFSP San Pedro), Port Operations San Diego (who also have cognizance over tug, pilot and port services for ships pulling into LA/Long Beach), MSCPAC, and the refinery as applicable. If there was potential to impact either ATG or COMNAVSURFGRUPACNORWEST evolutions, they would need to be consulted with, and could help in rearranging the scheduled evolutions to help accommodate the transit time from Long Beach to San Diego at the beginning or end of the week, as appropriate. They could also authorize the T-AO to directly work with the customer ships, helicopter squadrons, boat units, etc to come up with the solutions that would work best for both the oiler and the customers. If a T-AO pulled into Long Beach to load, it would be vital that this coordination be established as early as possible, especially with DESC LA and customers. The sooner that everyone finds out about the load port shift, the greater the chance that it will be a success because more people will be involved and support its implementation.

C. OPTION 2: BUNKER CONTRACTS

> DESC writes requirements contracts for the direct delivery of ships' bunkers fuels at 91 U.S. and 85 overseas-designated locations. (Ref. 10)

Using commercial fuels and bunker contracts is a second option. The Department of Defense places more requirements on the specifications for fuel than do commercial companies. For example, the military uses some fuels that must not freeze, even in the extreme conditions of the Arctic and Antarctic winters. Another example that is more relevant to our study is the fact that the JP-5 and F-76 that the Navy uses are required to have higher flash points than civilian jet fuel and Diesel Fuel Marine (DFM), also known as Marine Gas Oil or MGO. They are also required to add certain chemicals that will reduce the chance of static developing as they flow through the fuel lines, especially during transfer from one ship or aircraft to another ship or aircraft. This is important because a static spark at a fuel line connection could cause a major fire or explosion. (Ref. 17 and 18)

These differences mean that the ships loading these products would either have to inject the chemicals, to make the fuel match the requirements, or request a waiver from NAVSEA. Since the DOD uses F-76 and JP-5, which are similar to, but not exactly the same as their commercial equivalents, Diesel Fuel Marine (DFM) and Jet Fuel, regular DFM and Jet Fuel are not usually used in DOD assets. This can be changed on a case-by-case basis by obtaining waivers in a case of crisis or urgent need. It is also important to note that DFM is close to it's military equivalent F-76, so DESC has "bunkers" contracts to procure ships fuel in both foreign and domestic ports in which US Ships might dock that do not have a Defense Fuel Supply Point. These "bunker" fuel contracts are typically for commercial DFM on an as needed basis. Using these "bunker" contracts in

combination with getting JP-5 from the Mole pier in Long Beach is a very likely and attractive scenario. Another point that will be discussed later in this chapter is that bunker contracts could also be used in Hawaii or Mexico.

Using the "bunkers" contracts would actually have many advantages. Since DESC has bunker contracts set up in most ports, the bunkers (DFM) could be purchased in most ports, including San Diego and Long Beach. This would allow more flexibility in getting fuel to the fleet, and in the U.S., commercially provided DFM tends to be a little cleaner than military grade F-76. If Long Beach were used for refueling, the JP-5 could be loaded from the Mole pier, and the F-76 or DFM could be loaded from either the contracted F-76 provider or a "bunkers" contract DFM provider. In either case, there would be savings from not double handling the fuel: it would not have to be transported to Point Loma, offloaded to the "fuel farm" tanks, and then loaded back onto the T-AOs or other ships.

This would also save the transport time from Long Beach to San Diego, and like option 1, it would provide another option, and improve the San Diego berthing situation. In general, loading bunkers in Long Beach would have many of the same benefits that we discussed in option 1, but it would also be available in San Diego, and minimize concern about whether or not a significant load of fuel had recently been lifted from the refinery or it's holding facility. If the "bunkers" contract were used in San Diego, the possibility would also exist of transferring the fuel directly to the end user ships instead of going through the T-AO. It would have a lot less impact on the T-AOs weekly operational

schedule if a San Diego "bunkers" contract were used. It would also offer some savings in itself by reducing double handling of the fuel.

There are also a few drawbacks to using the "bunkers." First of all, as mentioned earlier, the bunkers would not have the same additives to reduce static discharges and increase the flash point. This could be a safety issue requiring special care to compensate or at least account for those differences. Also, using the bunkers contract would tend to cost more than the F-76 contract because it is for a quantity that is not pre-determined, but rather is just in standby mode. While we are using DFSP Point Loma as the standard against which to judge the options, it is also relevant that using a San Diego "bunkers" contract would not give the flexibility for the JP-5 that Long Beach provides. This could become important if a T-AO had to fill up one or two carriers with the fuel for their air wings. When looking at commercially available fuels, especially aircraft fuel, FSI (Fuel System Icing inhibitor), CI (corrosion inhibitor), and SDA (an anti static additive) might have to all be added to the commercial fuel in order to be useable for DOD aircraft without getting a waiver. The other negatives for using the "bunkers" contract in Long Beach were already covered under option 1, but to summarize, they were mostly of the ship's support nature.

Like many of the positive and negative aspects of using the "bunkers" contracts, the incidentals are very similar to the incidentals covered in the Long Beach section. Even if a port other than Long Beach were used for bunkers, the same issues would still surface including port and service costs, security, tugs and pilots, and the historical,

current, and future possible usage of that option. Finally, under the "bunkers" contract, if the T-AOs loaded bunkers for further issue to the fleet, the customer ships and squadrons would all have to agree to taking the DFM instead of F-76. This would not be a problem in most cases, and even if some ship did protest, the DESRON or PHIBRON commander could get a waiver for loading the alternate fuel.

The cost/savings analysis for using the "bunkers" contracts is a little harder to define than the cost/savings analysis for using option 1. If Long Beach were used in conjunction with a "bunkers" contract, many of the costs and savings would be the same, with a slight differential increase in the cost of the fuel itself compared to the F-76 that would potentially be loaded at GATX (this year). The bottom line is that it would tend to cost more than the straight F-76 contracts, but in the absence of F-76 availability, would be a good option.

D. OPTION 3: REFUELING IN PORT

We will now separately discuss refueling in port, but this option would be or could be used with many of the other options. For example, instead of having the T-AO pull in to Long Beach to load JP-5, the individual ships could do so. While loading F-76 from GATX might not be practical because one combatant could not lift enough of the fuel in one evolution to make it fit the GATX contract, there would still be the option of using the "bunkers" contract. Looking ahead in the list of options, the other in port refueling options include: tanker trucks, fuel barges, fuel bladders, Hawaii, Mexico,

setting up North Island as a pumping station to the anchorages off of Coronado, and although it is less practical, railroad tanker cars.

Refueling in port is a good option for a number of reasons. First, it would reduce double handling the fuel since it would be loaded directly onto the end-user ships instead of being loaded onto the T-AOs and from the T-AOs to the end users. It would also give an overall time and cost savings for the same reason. Another positive effect to refueling in port is safety. Everything can be completed at a slower pace because the receiving ship will not be concerned with trying to minimize her alongside time, as is usually the case in an under-way replenishment from an oiler. Taking things slower with less pressure could be somewhat safer, in terms of personnel, equipment, safety, and also environmental safety.

Looking at the San Diego berthing situation, refueling in port in San Diego would have minimal, if any impact on the berthing situation. However, if an alternate port such as Long Beach were used, it could free up berths in San Diego as ships refuel in other ports. Furthermore, if a ship were to refuel at a port that they were going to visit anyway, there would be no impact on their operational commitments, maintenance, administrative, or supply support. In terms of readiness, the key advantage to refueling in port, whether in San Diego or another port, is just having an easily implementable alternate plan in case of a crisis or emergency.

Regarding the negative aspects of refueling in port, probably the most significant drawbacks are environmental concerns. If fuel is spilled in port, it can have a lot more

significant impact than the same amount of fuel spilled 50 miles out to sea. This is the reason that Third Fleet has eliminated refueling in port as an option without special permission. Third Fleet will not permit ships to refuel in port unless there is an emergent situation or a ship is coming out of a maintenance period after emptying their fuel tanks. While it is probably a good environmental policy, it would need to be set aside or at least loosened if DFSP Point Loma was severely degraded. Another drawback to refueling in port is that unless it is done at a facility with a pipeline going directly from the storage facility to the pier, the delivery vehicle, whether a barge, tank truck or fuel bladder, might not have the capacity that larger ships, such as carriers, would require. This would mean that multiple connects and disconnects would be required, each one increasing the chance for a spill.

Considering the incidental issues involved with refueling in port, the port service costs and security can be considered negligible. In most situations, the ships would be in port anyway, and would require the same services even if they were not refueling. The delivery vehicles would have their own associated costs. When DESC got together with the representatives of the receiving ships, whether they were represented through their DESRONS, PHIBRONS, ATG, COMNAVSURFGRUPACNORWEST, or even MSCPAC and COMMTHIRDFLT staff, they would have to determine the relevant requirements, and work with Port Operations to find the most cost efficient methods to meet them. For many of the short fused solutions, refueling in port via numerous methods would probably be necessary, especially if the T-AOs were either low on cargo

fuel or not available due to out of the area commitments, maintenance periods, or numerous other reasons. Historically, the inport refueling option was often a preferred method up until the mid 1990s when Third Fleet restricted its use. Since then, some of the barges that were used for in port refueling have been de-activated, sold, or otherwise made non-available for Navy use, but not all of them. There are other in port refueling options available though.

In looking at the cost/savings of refueling inport versus refueling from an oiler that received its cargo loadout at DFSP Point Loma, it is important to remember that the DFSP at Point Loma would not be available in a contingency, and therefore we would be looking for the next best option. Refueling in port would save some of the double handling costs, especially if it were done at a facility where the fuel was already available via pipeline. The fuel would not have to be loaded onto another form of transportation, such as a T-AO, tanker truck, barge, etc., and then further transferred to the customer ship. The key cost consideration arises if an intermediate step were necessary to get the fuel from the storage facility to the customer. That is when the user requirements would have to be weighed against the costs of the different methods to determine the most cost efficient solution that meets the customer's needs. In summary however, refueling in port would add up to a similar overall cost to getting the fuel from a T-AO via DFSP Point Loma if assets were needed to transport the fuel to the ship, but if the ship could get the fuel directly from a pipeline at the pier, there could actually be significant savings. Since

implementing refueling in port would vary from method to method, we will hold off discussing implementation until we get to each of the methods.

E. OPTION 4: TANKER TRUCKS

Tanker trucks provide a method of delivering fuel to ships in port in the continental United States that is often overlooked. If needed, however, it could be one of the most responsive, most flexible options available. If there is a road between the customer and the fuel source (refineries, DFSPs, or even other bases with fuel storage capacities), tanker trucks are a viable option.

Beyond flexibility, there are a number of other aspects that make tanker trucks an attractive option. First, and related to the flexibility, there is a supply of trucks that could easily handle any refueling evolution in San Diego. Even if the DOD organic truck assets were fully used, there are companies contracted to deliver fuel by trucks for DOD, and more could be contracted with fairly short notice. Second, the trucks could be loaded at Miramar, which has a JP-5 pipeline connection to DFSP San Pedro. This would be particularly relevant if another local source for F-76 or DFM were used. Third, since tanker trucks carry smaller amounts and pump at much slower rates, the chances of having a large spill are significantly decreased. Considering the number of tanker trucks driven all over the country to every gas station, do you ever remember hearing about a fuel spill during the transfer process? Once in a while there is an accident on the road involving a tanker truck, but spills during the transfer process are much rarer than in any

of the transfer processes that the Navy uses on a daily basis. The slower pumping rates, however, have disadvantages, which will be discussed in the next paragraph.

Next, there would be minimal, if any impact on the ship's operational schedule, or on their in port support in terms of administrative, supply, or maintenance support since they could stay at the same pier where they docked initially. Furthermore, there would be no additional costs for port services or security, although some precautions would need to be taken for fire safety on the pier while the tanker trucks were there. Another possible advantage of using trucks would be that if just the fuel pier at DFSP Point Loma were damaged, fuel could still be loaded onto tank trucks there, and thus reduce the transit distance and time from the fuel source to the customer ships.

In looking at the negative aspects of using tanker trucks, the first one is the slow pumping rates. While the positive aspects of the slower pumping rates were emphasized earlier, it should also be noted that the slower rates would mean that an evolution that would take just an hour or two with a T-AO alongside at sea could take the better part of a day, or even more from the multiple tanker trucks that would be required to deliver the same amount of fuel. This could be a consideration especially if the ship needed to get underway quickly to support U.S. actions or reactions abroad, or at home. Double handling of fuel could also be considered a drawback, but the fuel would have been handled at least as much via the normal means of transporting it on the T-AO from DFSP Point Loma to the customer ships, so the added impact in that respect is negligible.

Historically tanker trucks have been used to deliver fuel to Navy ships for practically as long as there have been tanker trucks. Over the past few decades, with the increase in oiler capabilities and the availability of various in port fueling options, tanker trucks have played somewhat less of a role in delivering fuel to ships than they did back in the 50's, 60's, and 70's. When the restrictions on refueling in port were implemented in Third Fleet in the mid-1990s, tanker trucks were used so infrequently that they were not scrutinized under the new policy. The Third Fleet inport refueling direction was aimed primarily at the refueling evolutions by ships at the fuel pier and by barge inport. The slower, and arguably safer tanker truck method was not used enough to really be addressed in that direction. If tanker trucks were needed to deliver fuel to ships inport in San Diego, it is somewhat unclear whether special permission would be needed from Third Fleet, but at least this option should be considered.

While specific numbers for the cost/savings comparison were not readily available for this option, or most of the other options for that matter, the general costs and savings can be compared with the T-AOs loading fuel at DFSP Point Loma and taking it to the customer ships at sea. Due to the numerous truckloads required and the time involved for the ships, the trucks, and the fuel source activity, using tanker trucks would tend to cost more than using the T-AOs, not considering the overall operational costs of the T-AOs, but rather looking at just the single fueling evolution costs. This is the primary reason that they have not been used more frequently in the past two decades.

Using tanker trucks would definitely require coordination between numerous offices. Of course DESC and the customers would primarily be involved, but they would also have to work closely with the Port Operations office and Third Fleet staff to set up a smooth evolution. If a large group of ships needed to get underway in a fairly short time frame, coordination would be needed to minimize traffic congestion in San Diego bases, especially 32nd Street Naval Station, the home to most of the fleet in San Diego. If just the fuel pier were down, and not the whole DFSP at Point Loma, the DFSP could be a key player in filling up the large number of trucks required for such an evolution. In general, implementing the tanker trucks option would be a lot more flexible than implementing some of the other options, primarily because the trucks have the flexibility to go from any fuel supply point to anywhere there is a road.

F. OPTION 5: T-5 CONSOLIDATED CARGO EVOLUTION (CONSOL) WITH T-AO

Consolidated Cargo (CONSOL) "represents MSC-controlled tankers supplying cargo fuel to fleet oilers at sea." (Ref. 19:p. 6-6) By their contract, a certain number of the T-5 tankers are required to be able to CONSOL fuel to the T-AOs underway. This method of filling up the oilers could be especially valuable if Point Loma were disabled for either a short or long period. If DFSP Point Loma was suddenly disabled, and a T-5 was enroute there with a full load, a partially empty T-AO could take a good portion of the fuel that was scheduled for Point Loma, thus cutting out the middle man so to speak. If DFSP Point Loma was going to be down for a long period, the T-5s could be used as a

primary cargo fuel source for the T-AOs, although this would require some intensive schedule changes for the T-5s and the other customers that they served.

There are a number of reasons that the T-5 CONSOL option is beneficial. First, as was mentioned in the previous paragraph, using a T-5 to CONSOL a T-AO would "cut out the middle man," thus reducing the double handling of the fuel. This could save both time and money in most situations, since the T-5s and other tankers controlled by MSC typically are responsible for delivering 30-35% of the total volume of fuel DFSP purchases each year. (Ref. 20) It would also contribute to the readiness of Third Fleet; the T-AOs would be able to stay a little closer to their customers than they would by using some of the other options. This would also reduce the impact on operational schedules compared to some of the other options. The ships also remain in the San Diego area, so there would be minimal impact on the support system in terms of supply, maintenance and administration. There would also be less need for port service costs, security, tugs, and pilots for the T-5s, since they would not pull into port at DFSP Point Loma to offload. In fact, if the schedules were worked out correctly, the full T-5 capacity could be offloaded with just one console to each of two San Diego based T-AOs, if the two oilers were both at approximately forty percent of their cargo capacity when the unreps started.

The negatives involved with using the T-5 CONSOL option are not nearly as obvious as the positives. The first negative is that the T-5s are not used for underway replenishment evolutions on a regular basis. While they may be equipped to do the

conreps, their crews are often not experienced with the evolutions. This could cause safety concerns. Another potential drawback to using the T-5 CONSOL option is their schedules. The T-5's schedules could have them out of range of Southern California when they were needed, or, if they were in the area and were used for either single or multiple conrep evolutions, their other customers would not receive their fuel deliveries, which could affect their readiness. This would probably require MSC to "spot charter" other tankers to take up the slack in what would have been the MSC contracted T-5's schedules. Finally, on the days that the T-5's were involved in the CONSOL operations, and for half of their transit time to and from their next and last port, MSC would pay $49,900 per day for the T-5 being used by the contract. This contrasts with the $35,520 per day that is charged for commercial contracted tankers.

CONSOL operations from the T-5s to the T-AOs have been exercised one or two times over the past four years. While this capability was intentionally written into the contract for the T-5s, it has very rarely been used. The most common use is the periodic demonstrations to show that it still can be done. If this ability is not exercised more frequently, it will deteriorate as experienced T-5 crewmembers become fewer and fewer.

For the cost/savings analysis of the T-5 CONSOL option, again the reduction in double handling of fuel is a major savings, both in the onloading and offloading costs and in the associated port costs. The main issue would be whether MSCPAC was willing to pay the $49,900 per day T-5 contract price for the conreps, and half of their transit times to and from the conrep. The only additional costs that could come into play would be

possible transit costs for the T-AOs from San Diego to the rendezvous point with the T-5. If the T-5 were conducting multiple transits from Northern California or Washington ports, the T-AOs might need to travel North some distance to meet the T-5s part way. This would help reduce the T-5 transit time, and make their turnaround quicker. The bottom line for the cost/savings analysis of the T-5 CONSOL option is that it will cost less than the normal flow route of the fuel through DFSP Point Loma. The following quote from DoD 4140.25-M Vol II fairly well sums up a lot of the CONSOL evolutions, except the emergency CONSOLs.

> Scheduled CONSOL - is a scheduled replenishment at sea where all or part of the MSC tanker load is on board to support U.S. Navy requirements. Usually, fleet units load out at land based DFSPs. Delivery of the fuel directly to the fleet saves the cost of fleet oilers making round trips to DFSPs and may save the cost of resupplying DFSPs drawn down by Navy oilers. Scheduled CONSOLs shall be requested through DFSC-O

G. OPTION 6: FUEL BARGES

Assuming that there is not a direct fuel line to the pier, fuel barges are probably one of the most efficient ways to get fuel to ships in port. If there were a source for the barges to fill up at in San Diego, it would be even better. If the barges did have to go to Long Beach to load fuel, this option would still work, but the slow transit speed of the barges between Long Beach and San Diego could be an issue especially in a situation which required quickly refueling the ships in San Diego. In that case, it might make sense to have some of the ships receiving fuel via barge go up to Long Beach and anchor there.

Using the fuel barges option would have some definite advantages, whether in San Diego or Long Beach or from another local source such as a refinery. First, the fuel barges can go where the ships are tied up, and can pump fuel more quickly than the tanker trucks. This could make using barges a faster alternative if enough barges were available. That in turn would lead to fewer impacts on the ship's operational commitments. It would also reduce impacts on their supply, administrative, and maintenance support. The next benefit to using fuel barges is that there would not need to be additional security on the piers where the ships were tied up, though there would need to be barge operators. Also, since the ships would still be in port, there would be no additional tug or pilot charges, unless the ships needed to go to Long Beach to meet the barges. Lastly, since barges have been used by ships in the Third Fleet occasionally throughout the past few years, the crews of both the ships and the barges would be familiar with the evolutions, thus reducing the chance of a safety or environmental mishap. Barges would be especially good if they were used for F-76 at the same time as the Mole pier in Long Beach was used for JP-5, or possibly one after the other. In general, having the fuel barges is a sound option.

However, there are some potential drawbacks to using fuel barges. As mentioned earlier, the barges have a slow transit speed. If the barges for San Diego ships were filled up in Long Beach, the transit between Long Beach and San Diego would be so slow that the pressing operational commitments of the customer ships might be affected. In addition, depending on the size of the barge, it might take multiple barges to give a ship

the fuel that it would need. If multiple barges were needed for one ship, there might not be enough barges available to refuel all of the ships that required fuel in a short time period. Lastly, the barges involved would cost $23,425 per day. (Ref. 21)

Having examined the positive and negative aspects of using the fuel barge option, there are other related issues. The first issue that could be seen as either a positive or a negative aspect is double handling fuel. If the barges were loaded in Long Beach and taken to San Diego to be offloaded to the ships directly, there would be significant savings over the normal route of offloading the fuel to DFSP Point Loma to then onload it to a T-AO to be delivered to the ships at sea. However, there would be more costs than there would probably need to be, since the ships could save one more step in fuel handling by pulling in to Long Beach to directly onload fuel. It just depends on which options work best with the operational situation and the constraints imposed by all of the organizations and units involved. The next issue is the San Diego berthing issue. Again, this would depend on whether the ships were going to Long Beach to meet up with the barges or not, thus impacting the number of ships requiring berths in San Diego.

The cost/savings analysis for using the fuel barge option relies heavily on the way that the option is used. For example, using a fuel barge in Long Beach with fuel from Long Beach would be more expensive than having the ship pull in to load fuel directly from the pier, assuming that pulling in to the pier was an option, and not prohibited because of draft, length or other issues. However, using that same barge in Long Beach would be cheaper than loading it in Long Beach and then taking it to San Diego to be

offloaded to a ship. That option in turn would even be cheaper than offloading the same barge to DFSP Point Loma, then loading the fuel onto a T-AO for further issue to the customer ship. The bottom line is that using a barge will save money over the normal fuel flow chain, but how much money is saved depends on how the fuel barge option is exercised.

Like implementing the other options, using the fuel barges would involve DESC LA. It would also require the inputs from the customers, Port Operations, ATGPAC, and to a certain extent the operational commanders. Because it is a "refueling in port" evolution, it would take approval by COMMTHIRDFLT; in a national crisis that would primarily be a formality. DESC LA would probably work closely with MSCPAC to determine the most efficient way to use the oilers in conjunction with the fuel barges, so that the most efficient methods could be used in conjunction with each other, not in contrast to each other.

H. OPTION 7: FUEL BLADDERS AND/OR STANDING TANKS AT NORTH ISLAND, SETTING UP FUEL PUMPING STATION FROM NORTH ISLAND TO NORTH ISLAND PIERS

Especially in the case of a major degradation or destruction of DFSP Point Loma, it would be crucial to have an easily accessible, and preferably local fuel source. This is where Naval Air Station North Island (NASNI) could be important. The tanks that are there now, in combination with large fuel bladders, such as those used during Operation Desert Storm, could hold large quantities of fuel for transfer to ships at the piers at North

Island, probably in the "Carrier Basin." While this would possibly involve inport refueling, it could be an option that would return most of the same capabilities that were lost with the degradation or destruction of DFSP Point Loma.

There are many positive aspects to setting up North Island as a DFSP if DFSP Point Loma is destroyed or degraded. If a secondary DFSP were set up at North Island, normal operations would be impacted less than with some of the other options. There would be a large time savings for the customer ships, especially compared to having them refuel in Long Beach or other alternate ports. These factors contribute significantly to the readiness of Third Fleet assets. Also contributing is the fact that the standing tanks and facilities at North Island would make it easier to set up the alternate DFSP right across the channel from Point Loma. Having them so close would allow most of the normal administrative, supply and maintenance evolutions and support activities, both directly and indirectly related to the fueling, and the everyday operations to continue practically unaffected.

The drawbacks to setting up fuel bladders and using them and the standing tanks at North Island as an alternate DFSP are closely tied to the North Island base itself. The first drawback is that the large flat areas that could be used for setting up the bladders are already being used as parking lots, airfields, and the runways themselves. Dedicating some area for fuel bladders would impact those working and flying on NASNI. Whether it was taking away prized parking spots by the carrier basin, or giving the squadrons a little less area in which to park their aircraft, at least some, and maybe many people

would be unhappy with the idea of losing some prime space. In the big picture though, the minor inconvenience to NASNI would be more than made up for by the benefits that would be accrued.

Several other issues could be relevant, but are not necessarily good or bad in nature. One is the double handling of fuel. While the fuel would be handled just as many times if it were to go through DFSP Point Loma, it would be handled more times in this method than in some of the alternative methods already mentioned and some of those yet to be discussed. The next issue is safety. While the intent is not to downplay the safety issue of large fuel bladders, DOD and the Navy have been using them for many years now, and any initial problems should be worked out by now. In terms of using a specific berth at North Island for the temporary "Fuel Pier," the "carrier basin" would be a prime location for it, but since the carrier's berths are reserved anytime that they are within Third Fleet's operational area, the temporary fuel pier might end up at pier "Juliet." This would accommodate most ships, as long as the water depth near the pier was maintained at its charted depth, and not unintentionally fouled with silt from nearby dredging operations.

For the cost/savings analysis, setting up a DFSP at NASNI would represent a savings in some major areas, and incur costs in others. There would be savings compared to DFSP Point Loma evolutions if the ships were allowed to take the fuel inport. Again, as with the other options, cutting one or more steps out of the flow chain from producer to end user saves money. At least partially offsetting this, there would be a fairly

significant cost of initially setting up the fuel bladders. Beyond that, the new DFSP at North Island would also need a larger staff to go out and manually open and close valves as appropriate for the fuel bladders. Altogether though, the benefits and savings should outweigh the drawbacks and costs to make this an attractive option if DFSP Point Loma was taken OOC for what was anticipated to be a long time.

Looking at implementation, this option actually would take a little more coordination than some of the other methods. It would require the involvement of DESC LA and the end users, and it would also require inputs from MSCPAC, ATGPAC, Port Operations, COMTHIRDFLT, and COMNAVAIRPAC (since it is a Naval Air Station). It would probably also require some work by the SEABEEs to set up the bladders and all of the appropriate surrounding containment areas. Another aspect of implementation, that could almost serve as a separate option on it's own, is using Offshore Petroleum Discharge System (OPDS) ships in conjunction with the fuel bladders and standing tanks at North Island. This would not only give an extra tankers worth of fuel on scene, but it would also give a more stable place through which the T-5 and contract tankers could discharge their fuel. The OPDS ship could be anchored off of Coronado and provide a means for the tankers discharge to the shore fuel bladders. This is basically the way that the fuel bladders were designed to be used. While implementing this option would be a major undertaking, it would actually be one that would almost totally compensate for destruction of DFSP Point Loma.

I. OPTION 8: LOADING T-AOS AT NORTHERN DFSPS, EITHER SELBY OR PUGET SOUND, OR MANCHESTER AND SHUTTLING FUEL SOUTH

There is also the possibility that the T-AOs could load their cargos at either DFSP Selby or DFSP Puget Sound, though this would take the T-AOs away from their customers for longer periods than most of the other options. In a busy operational period, such as a sudden deployment of multiple ARGs or Battle Groups to the Seventh or Fifth Fleets, this would probably require the T-AOs to meet the battle groups somewhere between San Diego and Hawaii. Under normal operational schedules, it would mean that the T-AOs would make the runs North to load and return to the SOCAL OPAREA as quickly as possible. They would then probably remain in the area and discharge most of their cargo to customers before heading back North for another load.

This cycle of going North to load and then coming back to the Southern California area to discharge would have some advantages, but there would be many more disadvantages. In terms of advantages, there would be at least one, if not two more deep draft berths available in San Diego for as long as the Northern runs were being conducted, because the T-AOs would almost never be in port, especially in San Diego. When one was running north, the other would take care of all of the customer ships; when the first T-AO came back South, the second one would head north. Altogether the cycle would keep both ships from being inport in San Diego for very much time. As another advantage, the effects would be almost transparent to the Third Fleet ships. As long as one T-AO remained south as the other was making the Northern run, most of the

customer ships would be satisfied. Also there would be some savings in terms of saved port costs, tugs, pilots, etc. for the oilers, because they would not dock as often. One possible exception to this transparency would be when a ship operating in areas South of the typical SOCAL OPAREAS required fuel and stores. If that happened while one T-AO was on its Northern run, the regular SOCAL customer ships would not get their scheduled hits of fuel.

The biggest negative would be the increased usage of the T-AOs. They would be underway a lot more, which would increase their equipment utilization, and give them less time in port to conduct repairs. Over an extended period of time this could turn into a safety issue, but for a short term it would most likely be just a major inconvenience. Normal operational schedules for T-AO based evolutions, such as Refueling at Sea (RAS), Vertical Replenishment (VERTREP), or other training evolutions in the SOCAL OPAREA, could be negatively impacted if one of the T-AOs was on the Northern refill run and the other was on a Southern trip to refuel and resupply a deployed unit. If this were to happen a few weeks in a row, there is a good chance that the customer ships would be backlogged by the time either T-AO returned to the SOCAL OPAREA, and that the T-AOs would have to scramble to catch up. If this turned out to be the case, ATGPAC or COMNAVSURFGRUPACNORWEST would likely cancel some of the less vital customers to service higher priority customers, especially those deployed or getting ready to deploy.

As with the other options, there are some issues involved with this option that are difficult to classify as either positive or negative, but do still bear some discussion. First, although DFSP Point Loma would not be in the flow chain to the customers, one of the other DFSPs would be, so there would likely be no reduction in the double handling of the fuel. In addition, this option might affect training for some of the other units out of San Diego. There are numerous training evolutions that involve oilers, including Helicopter Deck Landing Qualifications or DLQs and Visit Board Search and Seizure (VBSS) drills, that could be affected by having only one oiler in the area at a time.

In looking at implementation, this option would require inputs from both DESC LA and MSCPAC. Beyond that, ATGPAC and COMNAVSURFGRUPACNORWEST would need to be updated on the schedules for the Northern runs, so that they could accurately schedule both training and real world evolutions. Implementation would also require coordinating the individual T-AOs and the DFSP's to which they were assigned to go. This would hopefully preclude having to either wait for the refueling berth to open up, or getting there to find out that they did not have enough fuel to refill the Oilers. The important issue there would be getting a full load as quickly as possible in order to return to Southern California to service the customers.

J. OPTION 9: HAWAII

With Hawaii being roughly a one-week transit from Southern California, it would not be very practical for an alternate fuel source for normal Southern California

operations. However, it would be of use if a Battle Group or ARG got underway from San Diego enroute to the Western Pacific and beyond, and needed to refuel as it transited, or even just a top off its tanks. Either pulling in to Hawaii or getting an unrep with a Hawaii based oiler could be an important evolution in terms of giving ships enough fuel to respond to changes in their assignments as they transited the Pacific, without having to be as concerned with arranging their next refueling. Having fuller fuel tanks after passing Hawaii will contribute significantly to the readiness of the deploying ships. It should be noted that ships on deployments to the Western Pacific often stop in Hawaii, and sometimes in Guam, to get a last hit of food, stores, mail, parts, and fuel.

K. OPTION 10: MEXICO

Another option, especially for ships deploying south, is to load fuel in Mexican ports. This would alleviate some of the transit times that would be required for the T-AOs to deliver a load of fuel to them, which could be especially important if this option were used in conjunction with option eight. One issue that could come into play is the concern over the fuel characteristics. While it would definitely not be Milspec F-76, it would still need to be in specification for the bunkers contract or DFM specifications. If the fuel was not up to specifications, it could potentially damage or contaminate the ship's fuel system, or at a minimum clog the fuel filters. These issues would tend to be minimized through the stringent testing requirements to which ships are required to adhere. The fuel has to pass certain tests before it can be loaded, and it is tested

periodically as it is loaded to ensure that the quality is maintained. Another common practice is to load fuel from a new source into separate tanks, not mixing it with the fuel onboard that is already known to be good. This too would help keep a possible load or partial load of fuel from contaminating the rest of the fuel. Assuming however that the fuel was good, this option would be a large cost savings, since the multiple day transit times each way for the oilers could be eliminated.

L. OPTION 11: USING JP-5 AS F-76

If DFSP Point Loma were incapacitated and for some reason there was not enough F-76 available, one option beyond the DFM/bunkers contracts would be to downgrade the cleaner JP-5 and use it as F-76. Since JP-5 is a cleaner product, it tends to cost a little more. Cost could become a consideration over a longer period, but this substitution is an option, especially for a limited time frame or a security crisis. Using JP-5 downgraded to F-76 would allow the T-AOs to fully load out at DFSP San Pedro's Mole pier in Long Beach, without having to shift berths from the commercial F-76 holding facility to the Mole pier. This could also be a good option if there was not an F-76 providing contractor in Long Beach that year. Using JP-5 as F-76 would help coordinate delivery; the barges that currently run from DFSP San Pedro to San Clemente and San Nicholas Islands could be used to shuttle fuel to San Diego. Also, since DFSP San Pedro has recently been receiving JP-5 shipments one to two times a month, there would not be a shortage there.

As a side benefit, the receiving ships would be more than happy to use JP-5 instead of F-76, since it would often help to clean up their systems. The effect is similar to running a car on cheap, low octane fuel on a regular basis, and then running a tank of high-octane fuel through it, possibly with a little fuel injector cleaner fluid. The car will run noticeably smoother after the cleaner fuel has run through the system, just like the shipboard systems will run a little smoother on JP-5 than they do on F-76. However, the systems were designed to run on F-76. You would not continuously put fuel injector cleaner into your fuel tank, and ships that normally run on F-76 should probably not run JP-5 for extended periods.

M. OPTION 12: RAIL

The last option, and one that would probably not be used, is Rail Road cars. Before and during World War II, an extensive railroad system was developed, linking most of the bases on the West Coast to the commercial rail lines. In most cases, these rail lines are still in place both on and off base, and could be used to transport fuel via rail tank cars. The problems would start with arranging a supplier for the fuel. Many suppliers, both internal and external to DOD, are not set up to load fuel into rail tank cars. Furthermore, transporting a significant amount of fuel by rail would probably be difficult considering the heavy commercial rail traffic already rolling every day. It would also be difficult to get the fuel from the rail tank cars onto the ships, since the tank trucks generally do not have their own pumps, and most piers do not have rails going out to

them. The rails tend to terminate closer to the supply warehouses. As you can see, this is an option, but it would probably not be considered until most, if not all of the other options were totally ruled out.

	LEAD TIME	COST/ SAVINGS	PRACTI-CALITY	ENVIRON-MENTAL	SUPPORT ISSUES	SHORT TERM	LONG TERM
Long Beach	72 hrs (+/-)	High Savings	High	Very Good	Little More Complex	Excellen t	Excellent
Bunker Contracts	72 hrs (+/-)	Mod. Costs or Savings	High	Very Good	Situation Pending	Very Good	Good
Tanker Trucks	72 hrs (+/-)	Moderate Costs	Moderate to Low	Excellent	Low Impact to Ships	Good	Moderate Adequate
T-5/T-AO CONSOL	2 days to 4 weeks	Mod. Costs or Savings	Position Pending	Very Good	Scheduling of T-5s	Position Pending	Very Good
Fuel Barges	3 days to 2 weeks	Moderate Savings	High	Good	Availability	Good	Very Good
N.I./Fuel Bladders	Weeks to Months	High Costs	Very Low	Good	Big Support Issues	Poor	Good but complex
T-AOs run North	1 to 3 Weeks	Mod. to High Costs	Low	Very Good	Supply and Maintenance	Poor	Hard work but Good
Hawaii	= Transit Time	Low cost ICW Transit	High ICW Transit	Very Good	Low Issues ICW Transit	Good in Transit	Not Very Practical
Mexico	1 to 2 Weeks	Low ICW Port call	High ICW Port Call	Very Good	Fuel Quality	Good W/ Port Call	Not Very Practical
JP-5 as F-76	72 hrs (+/-)	Low Cost	Moderate to High	Very Good	NAVSEA Waiver	Very Good	Costs More
Rail Tank Cars	Min 3 to 5 Weeks	High Cost	Very Low	Good Due to Mult Hndlng	Very slow + Complex	Poor	Not Very Practical

Figure 2. Summary of Options

IV. FINDINGS

A. INTRODUCTION

This chapter will discuss the most significant issues related to selecting an alternative fueling option, and then briefly describe the best options given each general scenario. The options that have been chosen as the best for each general scenario may or may not actually be the best for an actual situation; the details of an actual situation will undoubtedly call for slightly or even significantly different responses. When choosing an alternative, before selecting the best options for each of the four scenarios, the most significant inputs to planning and selecting that alternative will be discussed, including situational requirements, the BEM, Contracts, and possible barriers to implementation.

B. IMPLEMENTATION: CHOOSING AN ALTERNATIVE

1. Most Significant Inputs to Planning and Selecting Alternative

When selecting the best alternative fueling solution in lieu of DFSP Point Loma, there are many different issues that could impact which alternative is right for each individual situation. First of all, some of the options may be limited by the contracts that are already in place. If the contracts do not restrict the choices for that situation, then much of the decision process will be completed by the BEM. While there may be some sticking points to even the best solution available, there will always be an option, no

matter what the unique details of the situation. The following list of questions would be useful to ask when looking at the different alternatives:

- What options are available?
- How do they compare in terms of cost?
- Are there any special requirements either on the customer or contractor sides?
- Are there any contracts in place already that can or should be used?
- Which option(s) will best support the warfighter in the most economical way?
- Which other offices and organizations will be involved?

a. Contracts in Place

When trying to choose among the different options for providing fuel to the Navy if DFSP Point Loma is OOC, it is important to note that relevant contracts may already be in place. For example, DESC has bunker contracts in place, and DFM or MGO may be purchased under the existing contract. The T-5 contract is also in place; while a T-5 would cost more for a console operation than it would on a normal T-5 evolution, it would at least be covered under the contract. While it would require a NAVSEA waiver, there is also the option of using JP-5 instead of F-76. This would not require a new contract, just a source such as DFSP San Pedro and the Mole pier. In general, if it is possible to get the fuel to the customer ships and aircraft without going

outside the existing contracts, it is easier in most cases, and avoids possible future lawsuits that could be based on unintentionally violating or not using existing contracts.

b. BEM

After all existing contracts and options not requiring new contracts have been examined, the remaining options will involve puting out a solicitation, getting bids, evaluating the bids, and issuing new contracts. For most of our scenarios, the timeline would be significantly shorter for this evolution than for the normal contracting process. Still, the BEM would definitely play a significant role in evaluating the new bids. As was discussed in section B of chapter two, there would actually be fewer inputs into the BEM; presumably the other DFSPs besides Point Loma would maintain most of the same suppliers and quantities for which they contracted. The most significant changes in re-running the BEM would involve the companies that had been delivering to DFSP Point Loma. These companies would be able to bid on delivering to any of the alternative fuel sources for Southern California Navy ships and aircraft. The BEM would help significantly in choosing the best of all of the new offers.

c. Possible Barriers and Sticking Points

When looking at the different options that could be used instead of DFSP Point Loma, it is important to consider all of the potential problems of each option. In some cases, some options would either be impossible or impractical, or even if they were possible, the barriers or sticking points would make them much less attractive than some

of the other options. For example, while it would be possible to have all of the ships that needed F-76 pull into Mazatlan or Acapulco to refuel under the bunker contracts, it would not be practical to do so because of the time/distance involved. An example of a barrier to implementation would be if the T-5 console option was the most attractive option currently available, but there were no T-5s in theater that had console capability. It could take weeks to get a T-5 back into the area, and that redeployment would require compensation for the area in which it was working, by contracting another ship there in most cases.

As a final example of possible sticking points, if the rail tanker car option were used, it would be difficult, at best, to get fuel to the customer ships and aircraft. First, the fuel would have to be loaded onto the tanker train, which could involve trucks or other improvised means if there were not rails running directly to the refinery or storage point. After filling the trainload of tanker cars, there would be the issue of getting the train across the commercial railroads in conjunction with the normal rail traffic; however, in a time of national emergency, the fuel train would probably have precedence. After the fuel's journey, it would then have to be offloaded to the ships or the intermediate holding facility. This too could be cumbersome if the rails did not run all of the way out onto the piers, which they do not in most cases. The fuel would likely need to be transferred by tanker trucks from the railroad tankers to the ships. Thus, there are many potential sticking points in this solution, and each of the alternative solutions has its positives and

its negatives. Identifying the potential problems early on will definitely be an important part of choosing the best solution.

d. Situational Requirements Dictate

Although history does tend to repeat itself in a broad respect, every evolution is different in its unique details. Fueling evolutions are a good example of this. Two ships can be scheduled to undergo underway replenishment at the same time, same position, and same course and speed as they did the week before, and the two evolutions could be vastly different. There could be different weather, different officers controlling both ships, different crew members on different valves, and numerous other variances that could cause one evolution to go smoothly in one hour, and the other to have numerous problems and last well into three hours. Every situation has its own unique requirements, and these requirements naturally shape the way in which the situation is handled.

In the Southern California fueling issues that were studied in this research, every situation that might arise will naturally have it's own unique details that will partially dictate which options can and can not be considered. When a battle group is getting underway to support a crisis situation overseas, there is not time to go out and get bids for the lowest cost provider of the specific military specification grade fuel. The battle group will fill up as quickly as possible with whatever mil spec issues are available, and then go to commercial products under bunkers contracts, such as DFM or MGO, unless they can

get fuel on the way to their assigned taskings. The opposite would be true if the fuel were needed a few weeks or months from now for regular training exercises. This time frame would allow for the contracting system to go through its process, albeit somewhat expedited.

The next few pages will discuss what has emerged from this research as the best solutions for the short and long term, in the context of crisis and normal operations options. A number of the factors that have been discussed previously in this chapter should be kept in mind. The current contracts, the BEM, various barriers, and situational requirements all play a significant role in choosing the ideal solution for a not so ideal situation. While no solution may be perfect, at least one chosen using sound, logical reasoning will tend to be better than one chosen hastily. While instinct developed by decades working in the business is valuable, this instinct may be a poor guide in unique situations. It is good to have solid evidence to back up your actions and decisions.

2. Best Option for the Short Term in a Crisis Scenario

The easiest way to describe this is through an example. The following is a possible scenario that could easily happen. Because every situation is unique, and should be handled differently, this example is not intended to describe exactly what to do in this or a similar situation, but rather provides a starting point from which to reason out the best options as the situation may dictate. The example of a disabling catastrophe used in all four of these scenarios is an earthquake. In reality, the catastrophe could involve any

number of causes, including but not limited to those discussed in chapter two, section C. Also, note that "you" are not given a specific job title, description or organization. This was done intentionally to make the examples more universally applicable. The example probably gives more information than some offices would receive, but significantly less information than other offices would require. But as the saying goes, "all models are bad, but some are useful." Hopefully these will be some of the useful models.

Imagine that it is Tuesday morning, and you get the word that war has broken out in the Middle East. A Carrier Battle Group and two Amphibious Task Groups have been tasked to get underway from San Diego on Friday, to support U.N. resolutions passed months ago. As you are reading the official message, the TV news reports that there has just been a serious earthquake just north of San Diego.

Immediately you phone DFSP Point Loma and get the damage assessment. While it is still soon after the quake, initial estimates indicate that there was extensive damage to the fuel tanks there, the pumping station was destroyed, and a large section of the piping going to the pier was mangled beyond use. The initial estimate is that DFSP Point Loma will not be able to dispense any fuel for at least two to three months, and that time frame would probably take a miracle. You will need to ensure that the Battle Group and Amphibious Task Groups have enough fuel as they deploy within the next three days. Since both of the San Diego T-AOs were scheduled to pull in this weekend and take on large loads of fuel, you are fairly sure that they currently do not have enough fuel onboard to refuel all of the ships involved.

The next call you make is to DESC LA/DFSP San Pedro to see if they can give the T-AOs a load of JP-5. Assuming that they can, you call the T-AOs and arrange to get one after the other into the Mole Pier in Long Beach to take on as much JP-5 as they are configured to carry. You then call all of the ships that will be deploying and get initial estimates of the F-76 that they will need. The ships that will require a lot more fuel will probably need to be set up to start into commercial bunker barges, although with a short time frame it might be physically difficult to get barges loaded, to the ships, and offloaded. Tank trucks could also be used to get the fuel from the other sources. Although trucks are slower than barges, they could be an important tool, especially if there is a shortage of barges readily available. You then get the amounts of F-76 that the T-AOs are currently carrying onboard, and check to see if the Paramount refinery (through GATX and coordinated by DESC LA) can provide any F-76 to the T-AOs when they pull into Long Beach, either by barge, or from the GATX terminal.

When you have arranged the maximum amount of F-76 available on short notice for the T-AOs, if it still doesn't cover the needs of the deploying units, some MGO or DFM can also be loaded on the oilers in Long Beach under the bunkers contracts. If this still is not enough to fill all of the requirements, then priority would need to be given to the ships that had less fuel onboard when arranging the Refueling at Sea (RAS) evolutions for the next two to four days, and the possibility of issuing JP-5 as F-76 would be considered.

If all of the easily accessible fuel sources in Southern California have been exhausted, you would call the USCINCPAC Joint Petroleum Office, and prepare them for the estimated amount of fuel that would be required by the ships as they pulled into or were unrepped just outside of Hawaii. This would still be about a week away, so it would give them time to arrange and load barges, tankers, the oiler (if there is one there at the time), etc. Then, although it would be beyond your purview, the ships would most likely arrange for an unrep in the vicinity of Guam or Singapore, whichever worked out to be more efficient.

As you can see, there are short-term options in a crisis situation. In ranking them from the most viable to the least viable, the most viable would be loading the T-AOs with JP-5 at the Mole Pier in Long Beach, followed by the bunkers contracts. While the F-76 barge or GATX terminal option would probably be pursued before the bunker contracts, it is likely that there would not be any F-76 in the tanks waiting to be delivered, and there would probably not be a barge or T-5 that had loaded the F-76 for San Diego, but had not yet offloaded it. The next most viable options are tanker trucks followed by refueling in Hawaii, although Hawaii would not contribute as much to the ship's immediate readiness as they departed San Diego. In general though, two or three options would probably be used simultaneously to give most, if not all of the ships a full load of fuel as they departed from San Diego.

3. Best Option for the Short Term in a Normal Operational Schedule

The second scenario is like the first in some ways, but it does allow more time for arranging solutions. Picture that it is again a Tuesday morning, and again you see on the TV news that there has been an earthquake just North of San Diego. You call DFSP Point Loma, and get the same damage assessment that you received in the previous scenario. The main difference in this scenario is that there is no crisis deployment set to get underway in the next three to four days. This will provide a little more time to make arrangements for the fueling evolutions in Southern California.

The first information that you verify is the locations of the two SOCAL T-AOs and the nearest T-5. Under a normal operational schedule, you should have at least one of the oilers somewhere in the SOCAL vicinity. Depending on the level of cargo F-76 onboard, you would probably start arranging to have the nearest T-5 tanker bring a load of F-76 into the SOCAL OPAREA, to be consoled to both of the T-AOs. This would probably take a week or two to set up and take effect, but the combination of the F-76 that one or both of the T-AOs might still have onboard and the occasional use of a bunkers contract should cover two or three weeks demand, until the T-5 could get to SOCAL to CONSOL large quantities of F-76. In the mean time, you would also talk to the Paramount refinery and GATX (through DESC LA) to arrange a delivery of F-76 to either a T-AO directly, or to a barge to transfer to the T-AO in either Long Beach or San Diego.

If the T-5 evolution and the GATX evolution both ran into problems, you would then start arranging the operational schedules of the T-AOs to ensure that one is covering Southern California commitments, while the second is making a run to DFSP Selby. When the second T-AO returned to SOCAL, the first could make the transit to Selby. This would minimize the impact on the regular operational schedules of the customers. In order of preference, the best option is to set up a T-5 F-76 console with the T-AOs, then try to set up a direct onload of F-76 at GATX, then onload at DFSP Selby. Under all three of these options, JP-5 would probably be onloaded at the Mole pier in Long Beach, although F-76 and JP-5 could be loaded at Selby.

4. Best Option for the Long Term in Case of a Crisis Scenario

While the title of this section might sound contradictory, what it really describes is a case where DFSP Point Loma is damaged to the point that it would take closer to a year or more to get it back into service. These are the options that would be available if a crisis developed during that year. Again, it will be useful to set up the scenario through an example. This time you get the word that an 8.5 magnitude on the Richter scale earthquake has destroyed DFSP Point Loma, and they are scrambling to just keep the cracked and broken fuel tanks from contaminating the surrounding land and harbor. While no accurate estimate is available for the repairs, it seems as though DFSP Point Loma will not be in the position to take in, store, or dispense fuel for at least a year. There is just too much damage.

For the short term, you start by implementing the options from section 3 (immediately preceding this section), including the T-5 console option, the GATX option, and the Selby option. However, you realize that without DFSP Point Loma, you would need some additional, more locally available options under a crisis scenario. For these, you can prepare to implement the options listed in section 2 above, including loading JP-5 at the Long Beach Mole pier, using the bunkers contracts, using a barge load of F-76 or onloading the F-76 directly at GATX, tanker trucks, barges, and refueling in Hawaii. The important difference is that at least you have time to develop a plan in case of a crisis. Of course the details of the individual crisis situation would mold the options that you choose, but having a plan that you can modify puts you ahead of starting with no plan, and entering the situation unprepared.

5. Best Option for the Long Term in a Normal Operational Schedule

Again, it will be useful to look at this from an example. This scenario is basically an extension of the scenario described in section 4 above. You have now set up fueling options for the short term, and have a good plan for a crisis situation. Now it is time to develop a longer-term plan that will cover the Navy's fueling needs in San Diego until DFSP Point Loma can be reconstructed. All of the options in the first three scenarios are available and being used, but there might be other, more convenient and possibly cost effective ways to maintain the Navy's fuel flow in Southern California.

One option is expanding the use of Long Beach. Although it could be costly to clean tanks and retrofit the F-76 piping to the Mole Pier from DFSP San Pedro (which currently carries only JP-5 for Navy customers), it could be an option. Another option is expanding the use of the commercial facilities. This would either require; (a) a very flexible initial contract, (b) a very understanding and flexible refinery and holding company, (c) a significantly changed contract part way through the year, or (d) all of the above. While you believe that it will be answer (d), all of the above, you press for refinery and holding company flexibility, hoping that you can convince the contractor to provide the needed fuel under the current contract, just with a little flexibility in the delivery.

The third option would be to set up North Island as an interim DFSP. This could include using the standing tanks there, setting up fuel bladders, or bringing in one of the OPDS ships to either anchor off of Coronado or tie up to a berth in the carrier basin. While these options might seem a little drastic at first, you should consider them all carefully with all of the players involved, and at least know that you could implement this option if needed.

Altogether, there are numerous options available. For the long term, you will probably end up using a combination of a number of the options, but even if you are using 5 or 6 options simultaneously, remember that there are still more options available in case one or more of the current options fail.

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V. SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

A. SUMMARY

This research looked at the DOD fuel transportation system for Southern California, to familiarize readers with the options available if DFSP Point Loma is disabled or destroyed. A brief introduction covered the purpose, scope, organization, and benefits of the thesis in chapter I. Chapter II discussed the relevant background, including the various offices and organizations involved in the Southern California fueling issues, the current methods of getting fuel from the refineries to the DOD and Navy end users in Southern California and the various disasters that could disable or destroy DFSP Point Loma. Chapter II concluded by discussing the information sources used.

Chapter III contains the key contribution of this thesis. It discussed the various options that are available to deliver fuel in Southern California if DFSP Point Loma is disabled, including the positives, negatives and incidentals involved with each option. It was from that basis that chapter IV described the best fueling options for different contingency scenarios, including combinations of short term or long term horizons and crisis or normal operational schedules. Chapter IV It also looked at the largest inputs to choosing an alternative, including contracts, the BEM, barriers to implementation, and different situational requirements. Chapter IV emphasized that not all available options were discussed, and that the scenarios should not be used as step by step implementation

guides, but rather as a basis from which to discuss the options that may be available under each individual situation.

B. CONCLUSIONS

From this study, a number of conclusions can be drawn. The first and foremost is that if DFSP Point Loma is destroyed or disabled, there are other fuel sources for the Navy units in Southern California. Choosing these sources will depend on the situation, but the findings of this research conclude that the loss of DFSP Point Loma will not have a significant impact on Third Fleet readiness. The major impacts that implementing the other options could have involve costs and the operational schedules of the other assets involved, but not the customer ships.

The next conclusion finds that although the current refueling capabilities for the Navy in Southern California could have better built-in redundancy, the current capabilities support both the Mission and Vision of MSC, and therefore MSCPAC. MSC's mission is to "provide reliable and efficient sealift, combat logistics forces, special mission ships and maritime services to meet customer requirements." This mission is fully supported by the currently available fueling options, as is their vision "to be the leader in delivering innovative maritime solutions supporting national security objectives." While more readily using Long Beach facilities for F-76 would better support MSC's Strategic Plan, as long as the current options are periodically exercised and kept available, MSC will satisfy the fundamentals of their Strategic Plan.

The current fueling situation in Southern California also sufficiently supports DESC's Mission and Vision. Their mission is "to provide the Department of Defense and our customers comprehensive energy support in the most effective and economical manner possible." However, there may be some opportunities for savings by loading T-AOs with JP-5 in Long Beach, and possibly arranging to load F-76 there. If DFSP Point Loma is ever taken out of commission, the Long Beach option will probably be the first one implemented, so it would be better to know ahead of time whether or not the F-76 option would work there, and if not, what would have to be done to make it work. DESC's Vision, "to be recognized as the best and most effective energy support organization in the world" is also supported by the fueling situation in Southern California. DESC and DESC LA have continued to provide outstanding support to all of the units in Southern California, despite the cutbacks in the 1990s, the multiple rounds of Base Realignment and Closures, and the overall tighter defense budgets in recent years. DESC's highly experienced staff are responsive to the ever-changing customers' requirements, and the middlemen between DESC and the customers. A quote from the Defense Energy Support Center organizational pamphlet states:

> At DESC, the number one priority is fueling the forces. When men and women in uniform are called upon to defend the nation or assist in a crisis, they respond knowing that the petroleum product they need to complete their missions will be where they need it, when they need it. DESC's 'no excuses' philosophy helps to fuel the forces around the globe, plays a part in getting your mail to you and keeps Lady Liberty shining bright. That's a partnership in which all can share.

C. RECOMMENDATIONS

1. Recommendations for DOD

Having a contingency loading operation plan for JP-5 and F-76 in Southern California could be critical in a time of national emergency or crisis. The following recommendations are for DOD, including DESC, MSC, DESC LA and MSCPAC.

The *first recommendation* is to exercise the different options as frequently as possible, but at least yearly. This will maintain the proficiency for all persons involved in the fueling operations, and also hopefully identify any possible problems in a non-crisis situation.

The *second recommendation* is to include contract options for loading T-AOs with F-76 at commercial facilities, and exercising that capability as frequently as possible. This could possibly be done in conjunction with T-AOs coming out of maintenance periods, to maximize the cargo that they onload to come as close to the commercial facilities discharge quantity requirements/requests as possible.

The *third recommendation* is to have a yearly conference or teleconference between all of the key people involved at MSC, MSCPAC, DESC, DESC LA, and USCINCPAC JPO to discuss current operations and Southern California fueling options. Key people should be included from contracting, bulk fuels, tankers, and probably more. The conference should be held just after running the BEM and before the contracts are awarded. This would allow backup capabilities to be considered in issuing the contract,

and all key players will have a good idea of what steps will have to be taken in case of a crisis at DFSP Point Loma.

2. Recommended Further Studies

a. Berthing

One issue that was briefly discussed in this research was the San Diego deep draft berthing situation. While there are fewer ships in San Diego now than there were either during World War II or Vietnam, there is still a periodic problem finding a berth for the deep draft ships, especially the T-AOs. With the great improvements in information technology over the past ten years, there should be an optimization program to prioritize and automatically assign berths within San Diego. A program could be developed that takes into account the desired berths of the ships and their chains of command, along with their operational schedules, drafts, and any number of restrictions. The inputs could be updated regularly through message traffic or a separate system. The main goal would be to ensure an available berth for a deep draft ship, while maximizing the satisfaction (or minimizing the dissatisfaction) that each ship has with its assigned berth. As a side benefit, once the program was operational, it could eliminate the Port Operations Office's need to manually assign berths.

b. Operational Schedules

As with the berthing issue, there are probably Information Technology (IT) solutions that could coordinate the weekly operational schedules of the T-AOs and their customers. Currently, the customer ships give their requests to ATG for fueling evolutions at sea. ATG then schedules each ship for a certain time slot in the oiler's schedule. When ATG puts out the schedule of the unreps for the following week, the oilers lay out the unreps on a nautical chart of the area in which they will conduct the fueling evolutions. From the oiler's pencil and paper calculations, the positions are added to the times, and the oiler puts out its own schedule.

Follow on research in this area could develop an operational schedule program that would consider the customer ships' fuel requirements, where the first evolutions would start and the last ones would end, any requirements for positions throughout the week, and other requirements as each situation would dictate. Computer based charts together with the inputs into ATG's weekly oiler operational schedule program should be sufficient to set up the whole week's schedule with times, dates, positions, courses, speeds, etc. to then just be checked and released by ATG. Unless there were any problems, the oilers would not have to re-do the ATG oiler's weekly operational schedule, as is the case now. This could also provide some added cost and time benefits if it were run as an optimization program.

c. Cost/Savings Analysis

The final area recommended for further research is the cost/savings analysis portion of the Southern California fueling issue. The information in this thesis could be used as the basis from which to look at the more prominent options, and compare their costs and savings in relation to the normal method of refueling from the T-AOs that filled up at DFSP Point Loma. For example, loading the T-AOs in Long Beach at the Mole pier and the GATX terminal instead of at DFSP Point Loma could save money on a regular basis under normal conditions. From the information considered in this research, there could be savings in a number of areas, including reducing double handling of fuel, transportation costs, and administrative costs. It would appear that loading the T-AOs in Long Beach on a regular basis could possibly save the Navy hundreds of thousands of dollars each year. Further cost/savings analysis of contingency options available for JP-5 and F-76 load-outs in the event that the San Diego fuel farm at Point Loma is not available would be of value for both contingency operations and day-to-day evolutions.

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APPENDIX A. SURVEY INSTRUMENT

While only 1 of the over 25 copies of this questionnaire that were sent out was returned, it did give those personnel that I questioned either in person or over the phone a good idea of what questions I was looking at. This made the interviews in person and over the phone much more productive. The following is a copy of the questionnaire as it was sent out via email:

Thank you for taking time to help with the research I am conducting. Any comments you have in regards to the following questions will be greatly appreciated, even if they are just Points Of Contact or thoughts or suggestions. Also, please feel free to contact me at one of the numbers or email listed below.

Very Respectfully,

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LA/Long Beach and San Diego Fueling Operations Questionnaire

1. Where does JP-5 and DFM come from on the West Coast for DON fueling operations and what is the fuel flow chain (custody/responsibility and physical) from production to delivery to the ships?
2. What advantages would there be to loading Southern California Oilers in Long Beach versus San Diego?
3. What disadvantages would there be?
4. How would this affect the berthing situation in San Diego?
5. What additional costs would be incurred due to loading in Long Beach?
6. What savings would be accrued?
7. What steps would be necessary to support implementation of the loading port shift?
8. What government agencies and offices are and would be involved in loading oilers in Long Beach?
9. What additional personnel would be required to support loading in Long Beach?
10. What would be the total impact in terms of both personnel and equipment?
11. Is the shift in loading ports easily adoptable by the ships?

12. How would the shift affect the operations of the oilers?
13. How would the shift affect ATG?
14. How would the shift affect other operations?
15. What are some of the current problems with the berthing situation in San Diego, and what are some possible solutions?
16. When did the last MSC or Navy ship pull in to Long Beach, and what arrangements had to be made?
17. What pier or piers in Long Beach would be required?
18. What government agencies or commercial companies now control those piers?
19. What are the port operations costs in Long Beach and San Diego (tugs, shore services, supply, mail, etc.)?
20. What admin would be necessary in order to effect the shift?
21. What are the Amount of JP-5 and DFM taken to fleet by SOCAL oilers per year?
22. How would this shift affect readiness, of both the oilers and the fleet?
23. What barriers are there to having MSC oilers pull in to Long Beach and load?
24. What are the loading costs in San Diego/Long Beach?
25. How does the shift in load port fit in with MSC's Strategic Plan and the guidance of DESC and DOE and other government agencies and offices?
26. If Long Beach were needed for a contingency loading operation for JP-5 and or DFM, what arrangements would need to be made? (i.e. if San Diego was unexpectedly unusable for whatever reason)
27. For such a contingency, what costs would there be?
28. What historical data is available at your location in regards to the decision to discontinue use of Long Beach facilities for Navy/MSC loading operations? (Cost benefit analysis studies, archives, old billing statements, anything related)
29. Is there any other information, old files, reports, charts, or anything else at your location that would be of relevance to this subject?
30. What is the relationship between DESC and the Navy and MSC?
31. What are the fuel storage capacities in San Diego and Long Beach/LA facilities?
32. What factors were considered in discontinuing use of Long Beach?
33. What is the cost per evolution to onload oilers in San Diego?
34. What would be the cost per evolution to onload oilers in Long Beach?
35. What is the cost per evolution to offload the "Black Hull" ships in San Diego?
36. What is the cost to transport the different products from the LA/Long Beach area to San Diego via the pipeline and via contract tankers?
37. What Political influences have come into play in the process of shutting down LA/Long Beach as a possible load port?
38. Is there any relative legislation that affects the use of LA/Long Beach?
39. If so, where could copies of it be found?
40. Who would the politicians involved be?
41. Do you know of any other good points of contact at MSC, DESC, DOE, or any other office that might be of further assistance in this subject matter?

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